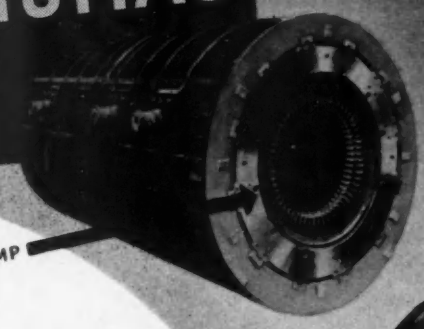
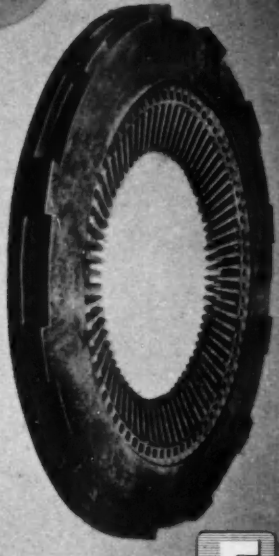
ELECTRICAL TIMES

THURSDAY
6 NOV.
1952
NINEPENCE

FERRANTI NOMAG
Non-Magnetic
CAST IRON



FERRANTI NOMAG STATOR END CLAMP



For the B.E.A. Stourport power station, English Electric Company Ltd. engineers specified Ferranti Nomag for the stator end clamps. It has proved to be eminently suitable for this and innumerable other applications in the electrical industry because of its unique combination of qualities. Nomag characteristics are:

Resistivity	150 *microhms per cm cube*
Resistance-temperature coefficient	*Between* 0°*C and* 100°*C per* °*C* = ·00045
Physical toughness	*Izod value* 29 *ft. lb.*
Maximum magnetic permeability	1·03

Good machining properties

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Yes—AND 740 cells in use

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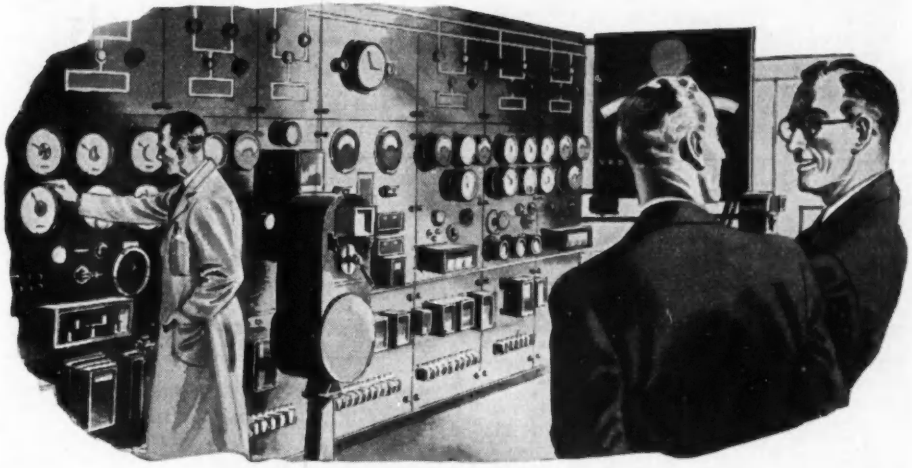

★ *These are the actual details of the performance of Nife batteries operated by a Municipal Authority.*

Every Nife battery is a superb example of precision engineering in steel. This technical perfection is the reason why there is 'longer life in a Nife'—and almost complete freedom from replacement costs.

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N25

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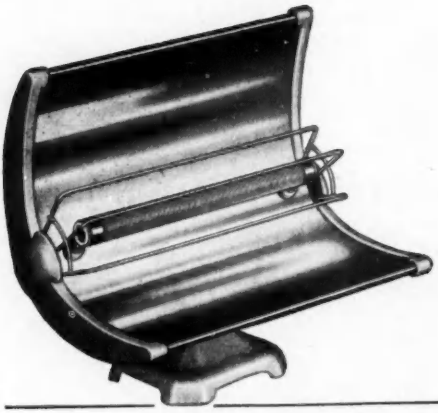

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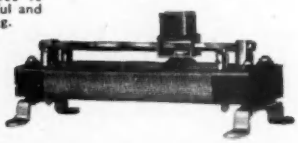

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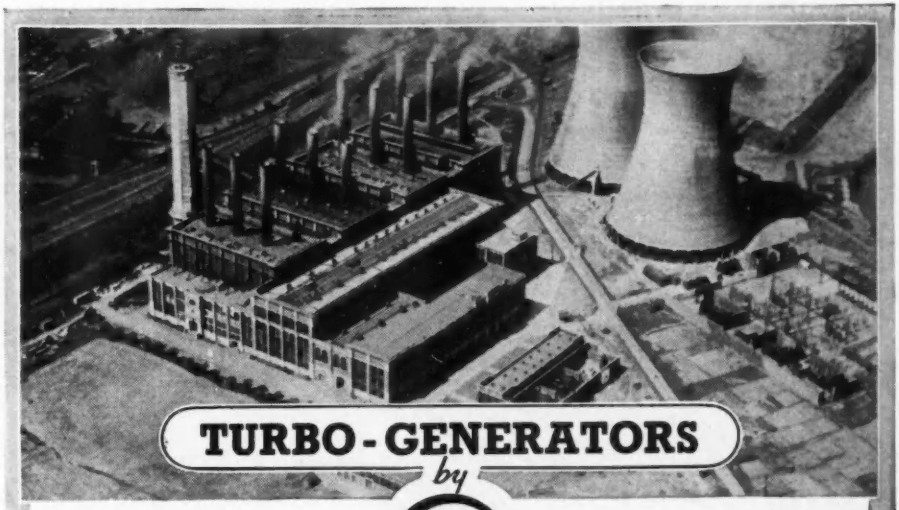

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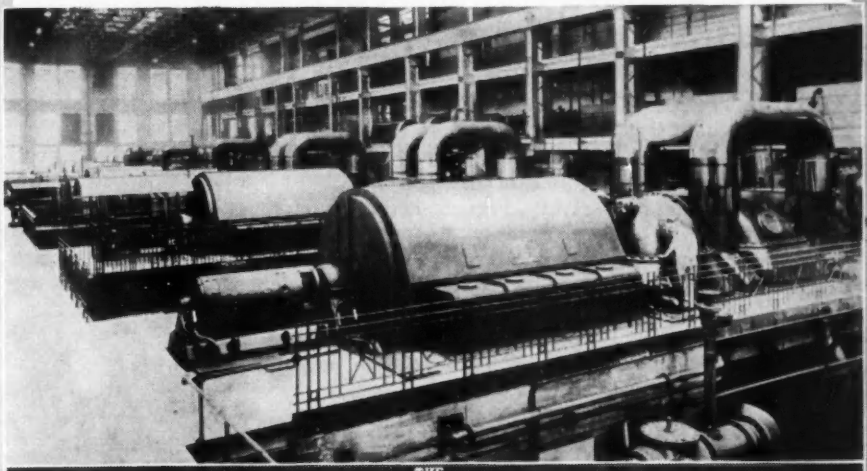

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The electric Cafe Fountain shown is one of several Jackson Boiler installations in use in the store. Fitted on an island site, boiling water can be drawn from either side.

Further proof of 'Jackson' reliability

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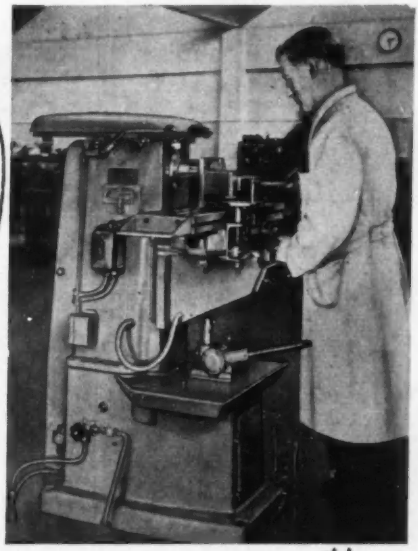

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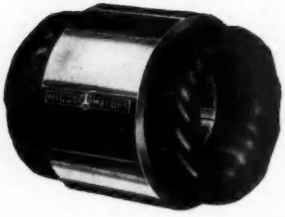

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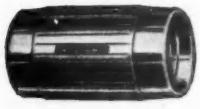

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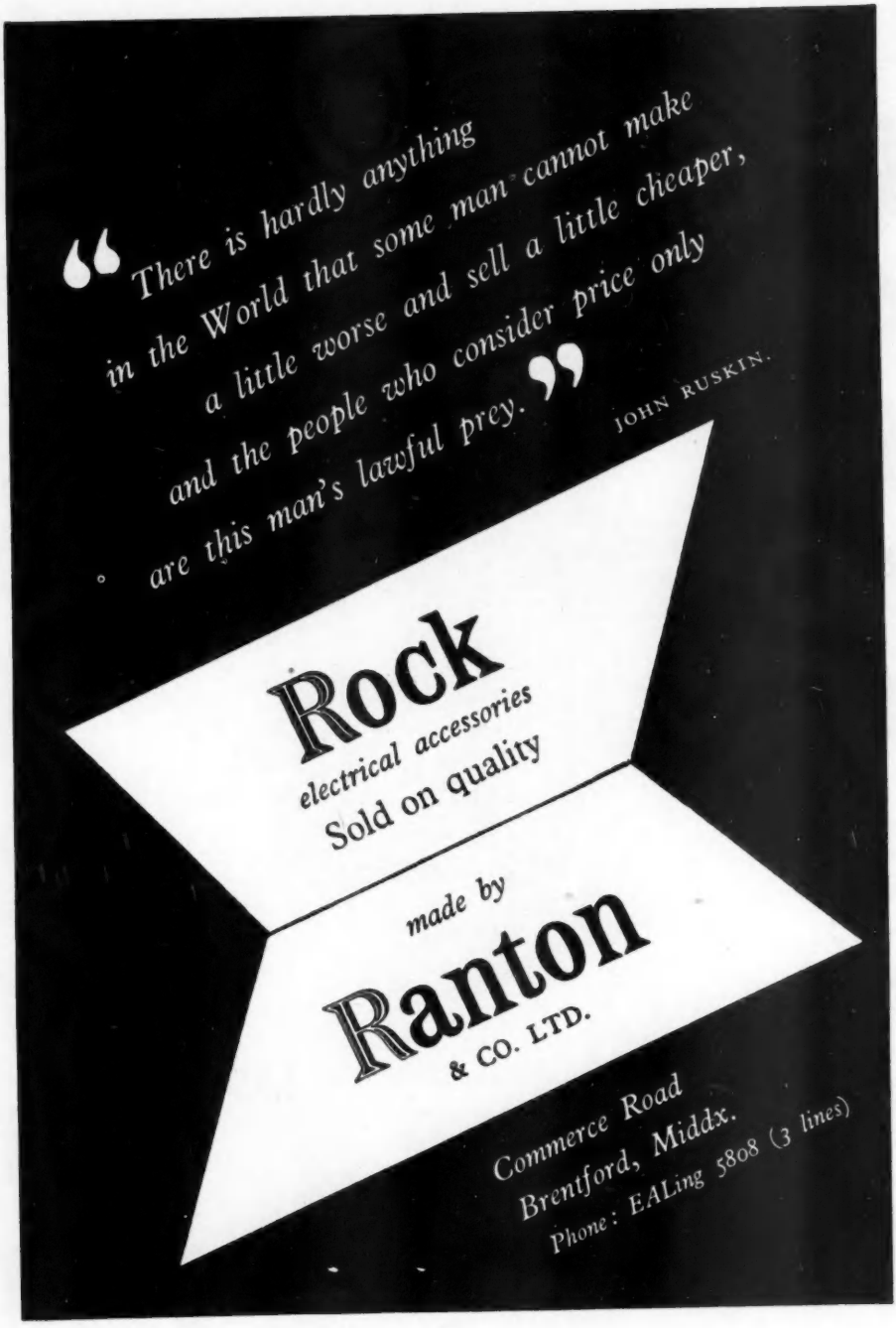
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a little worse and sell a little cheaper,
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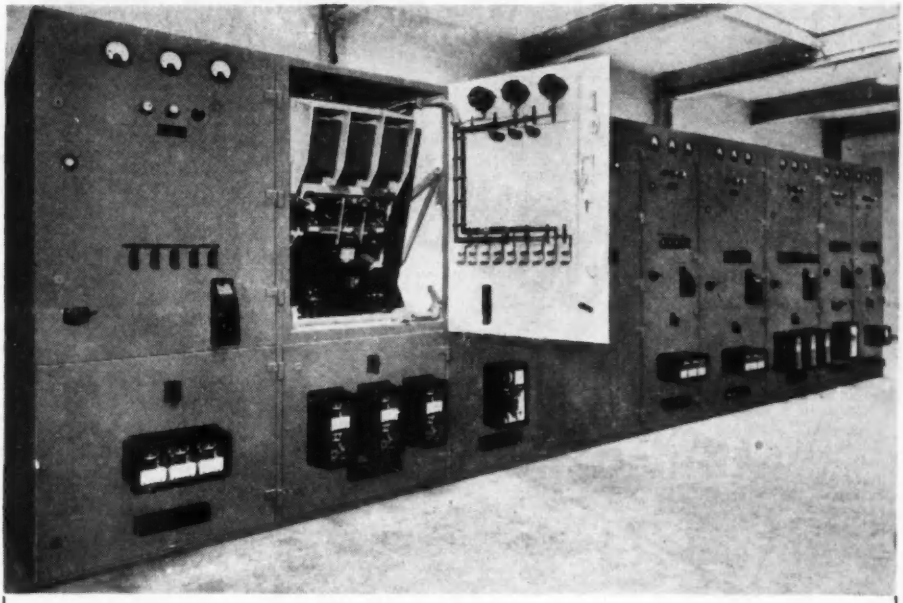

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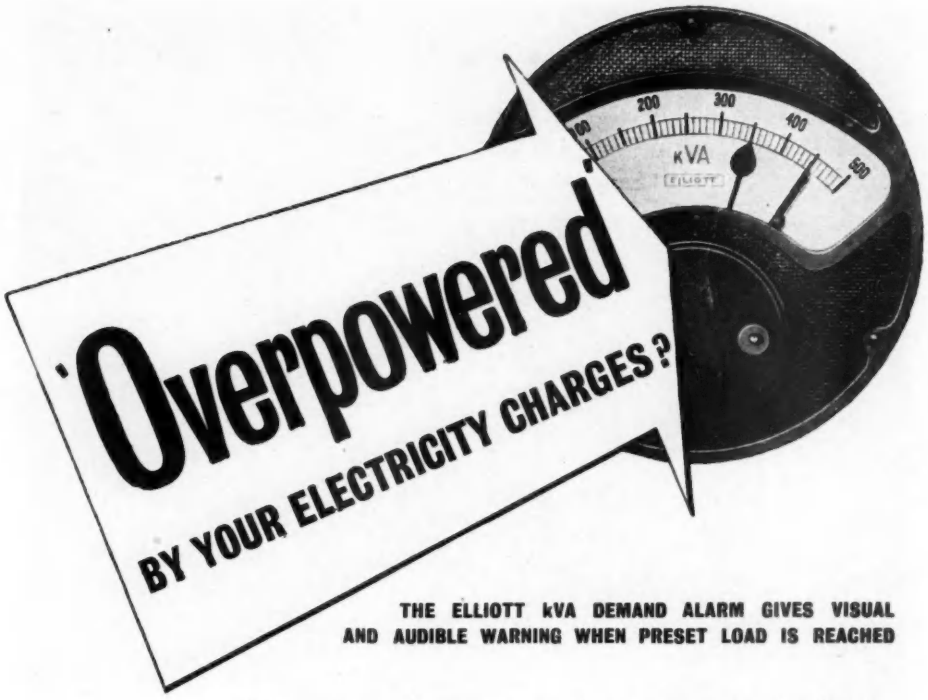

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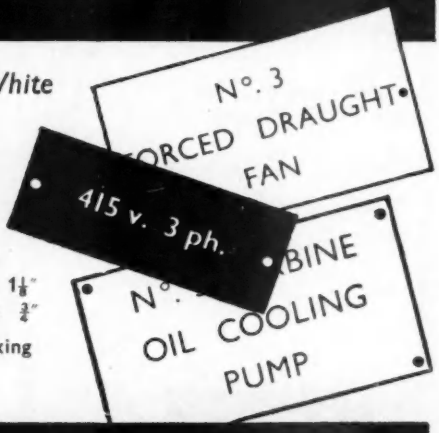

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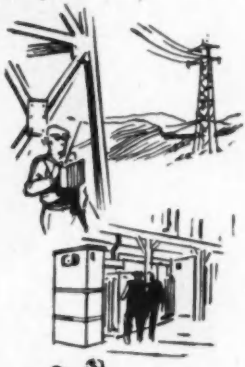

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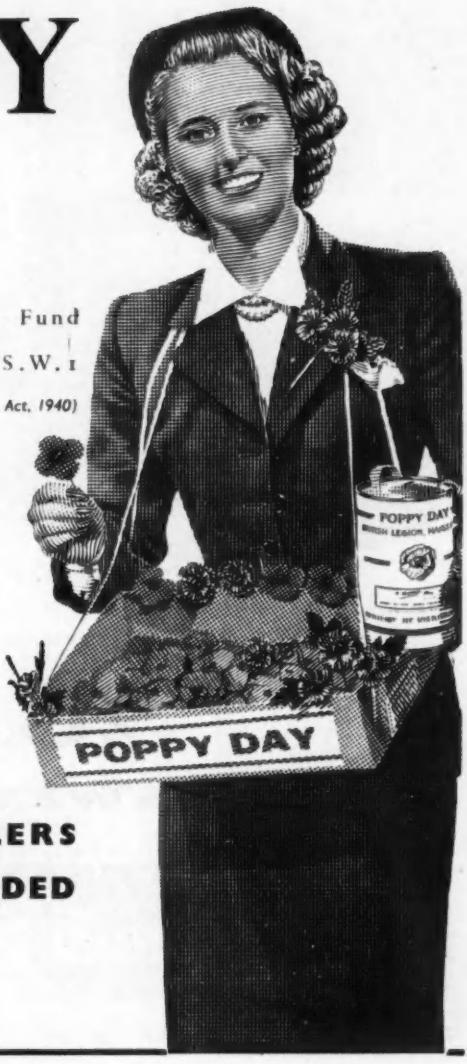

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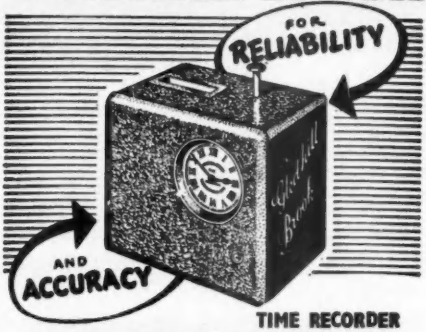

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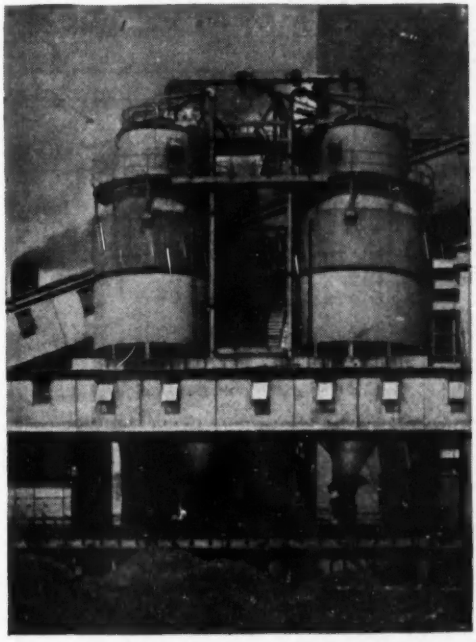

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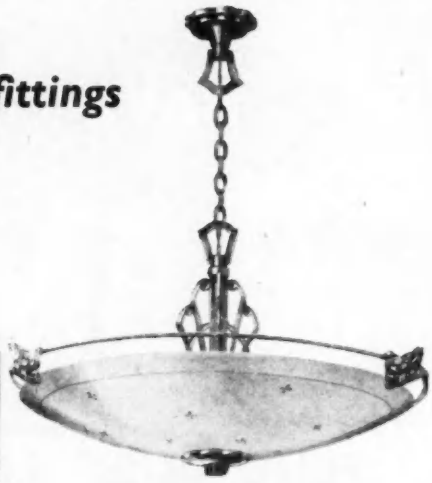

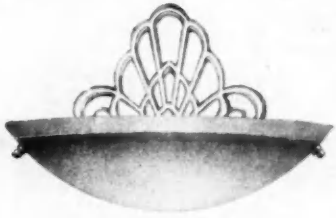

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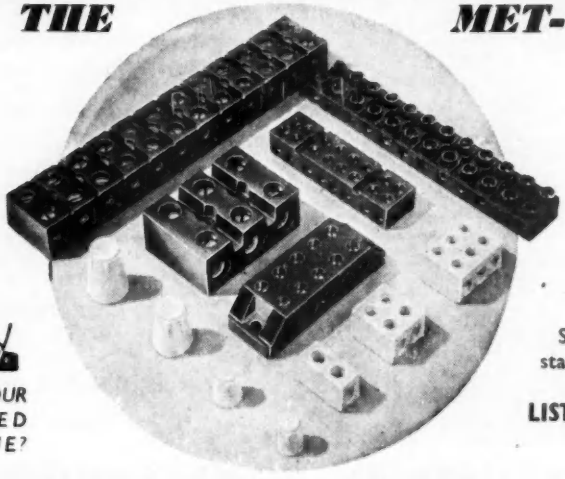

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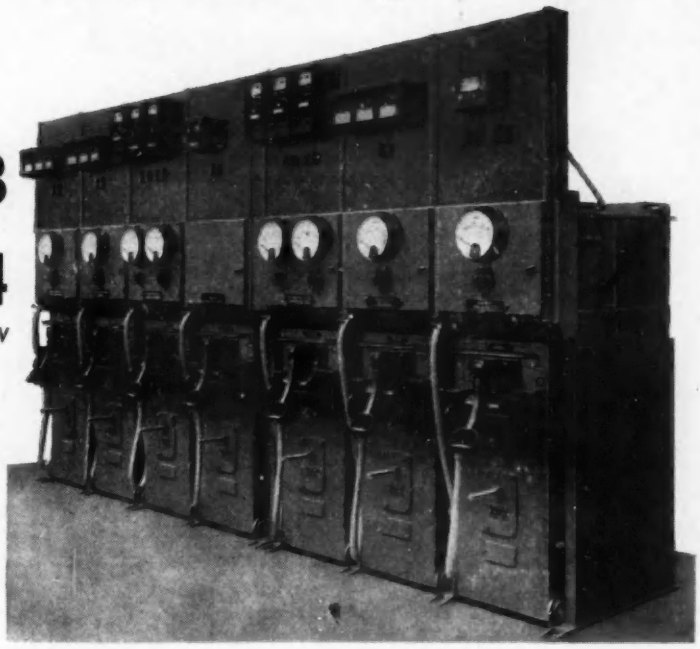

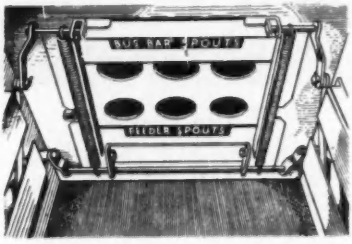

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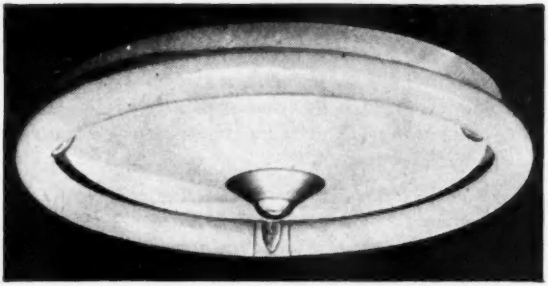

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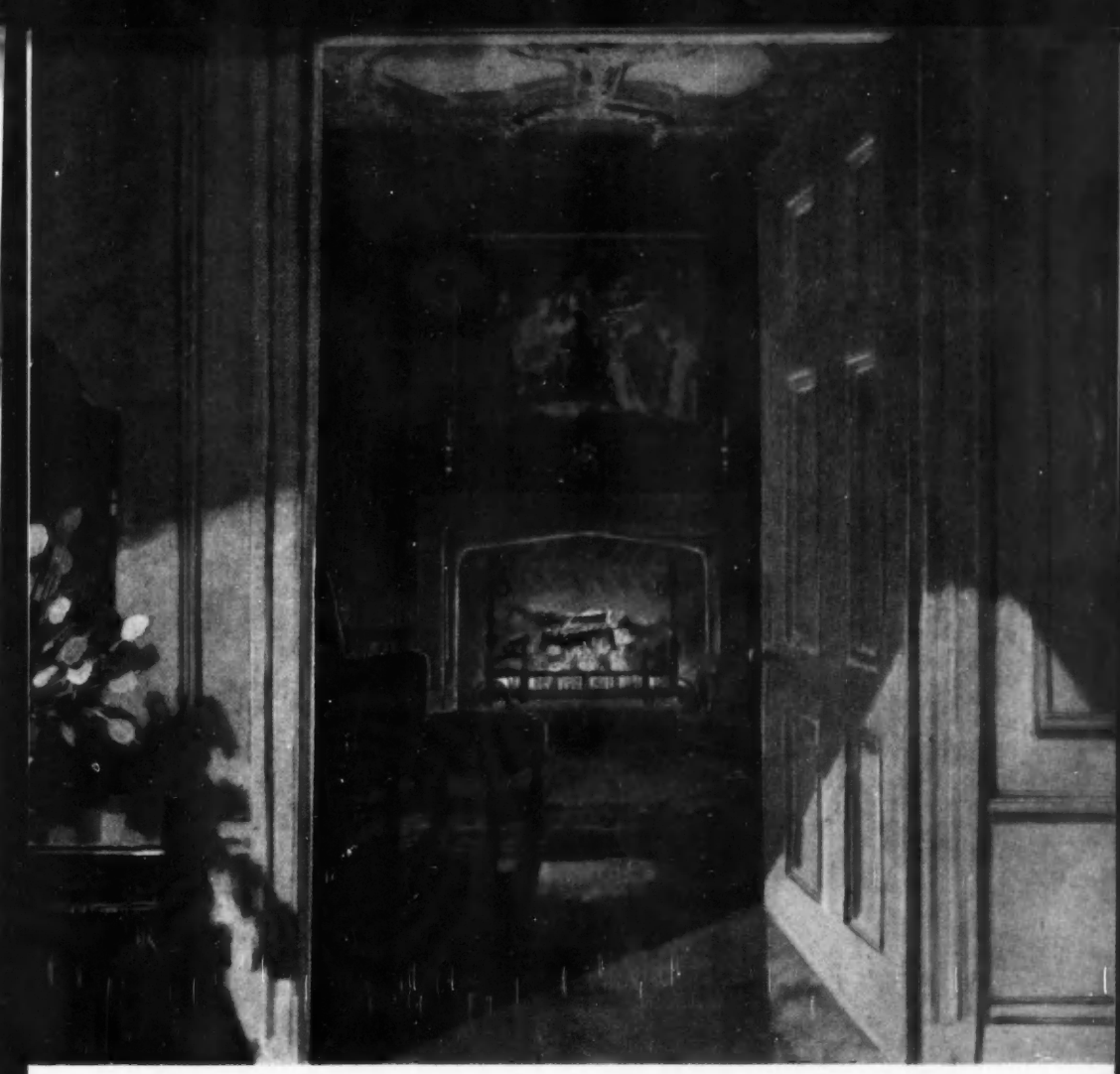

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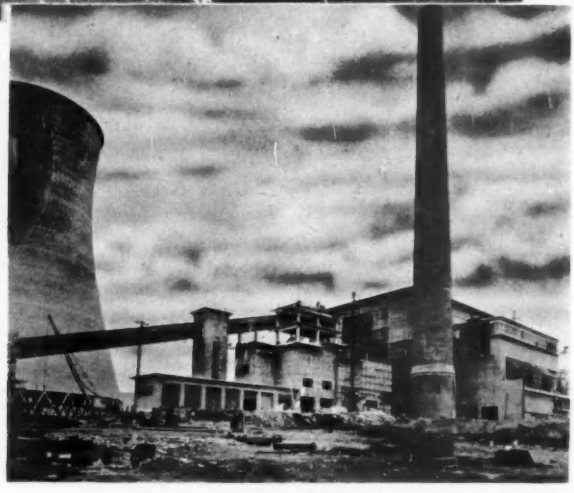

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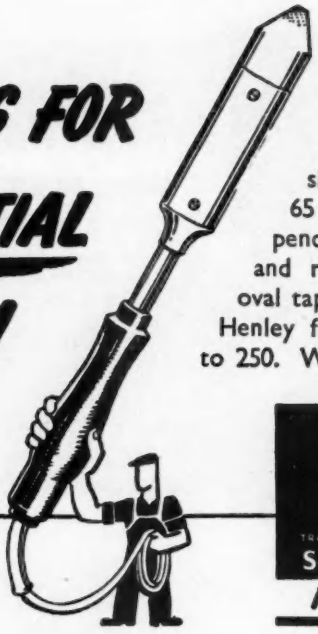

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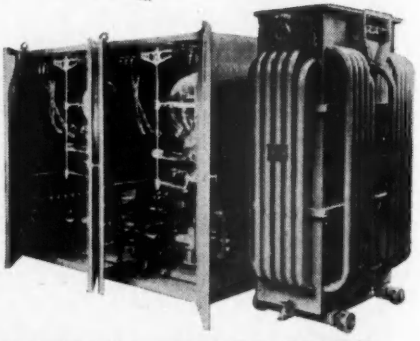

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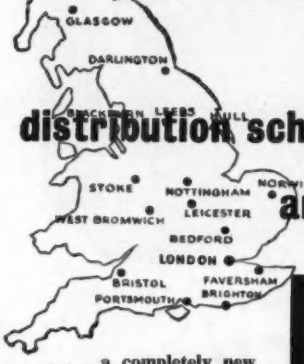

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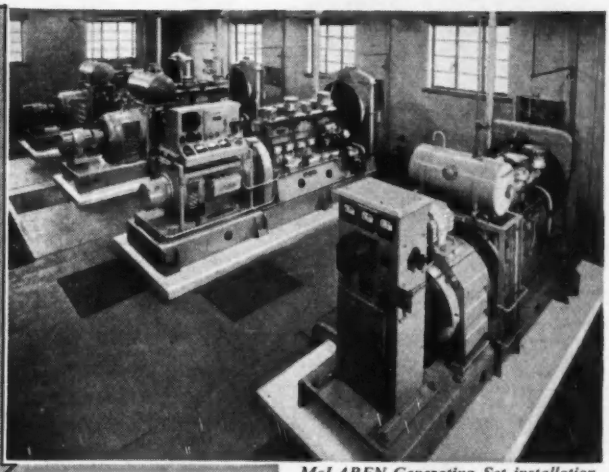

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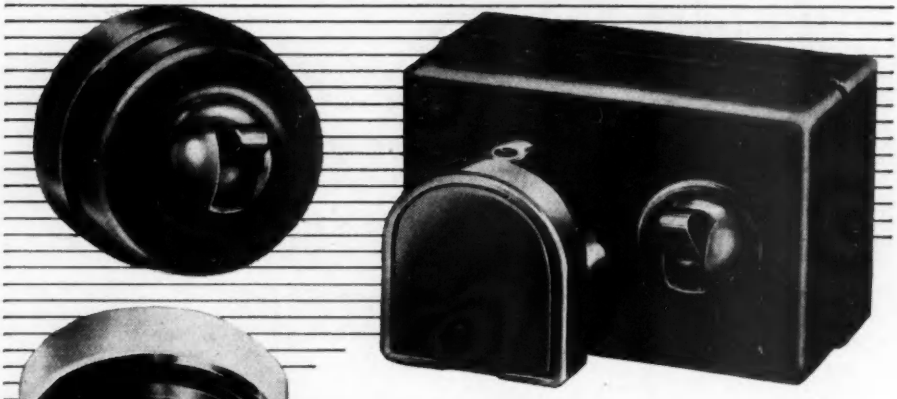

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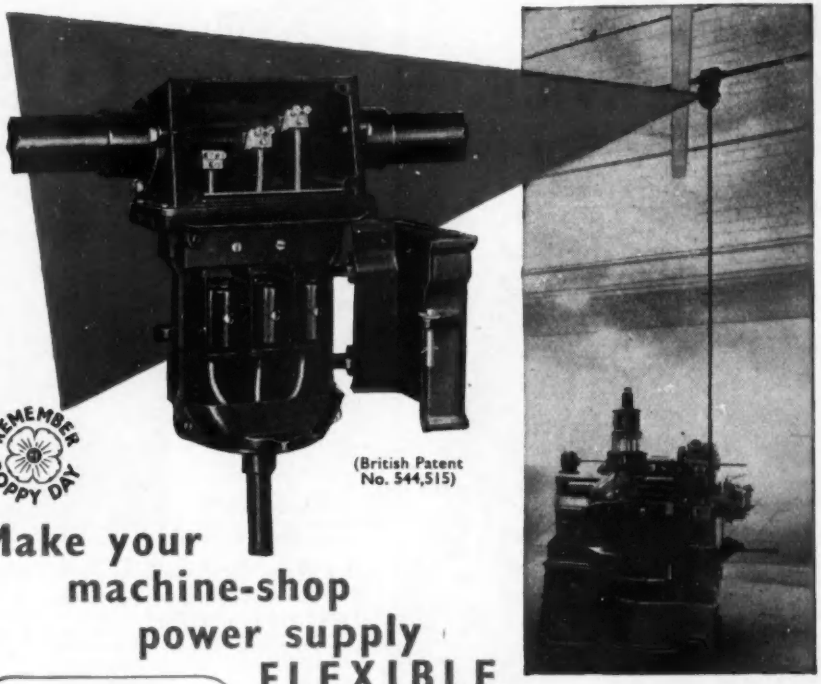

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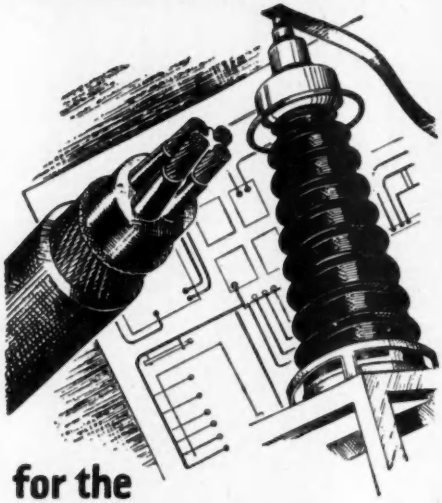

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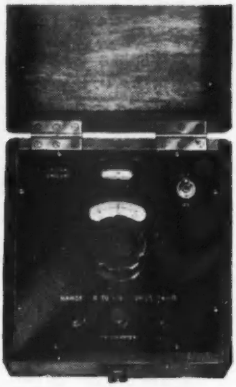

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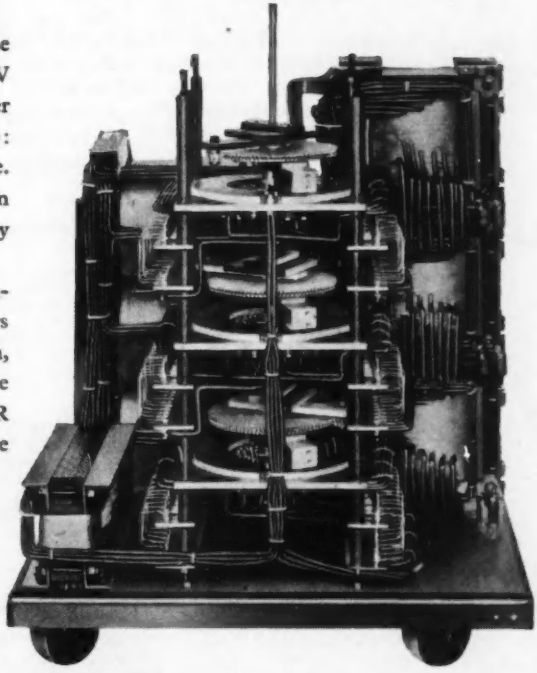

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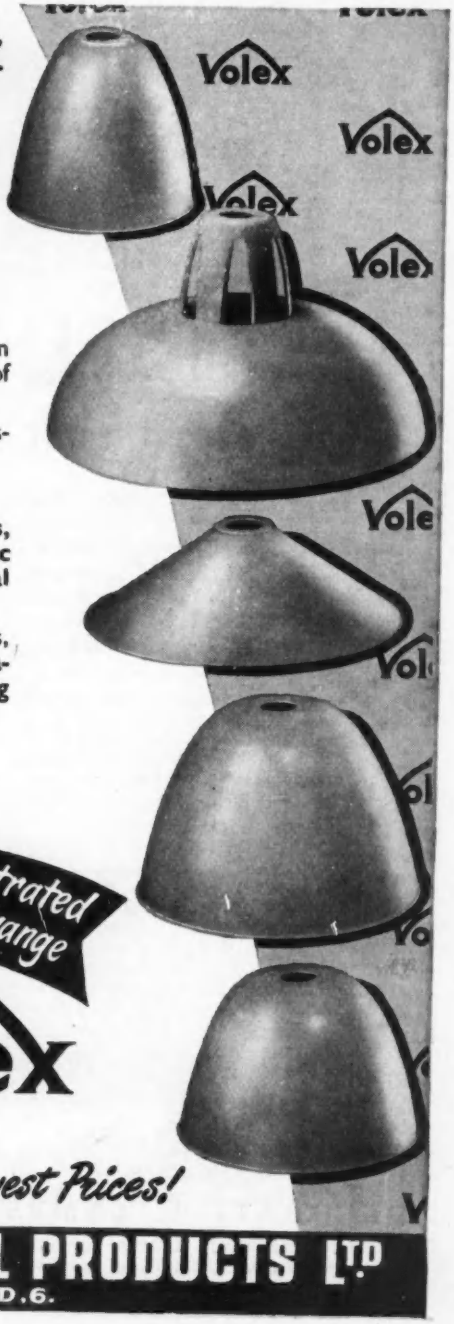

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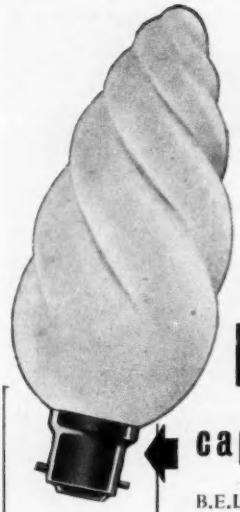

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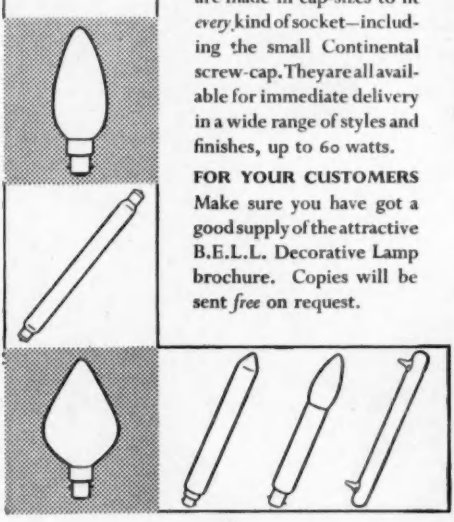

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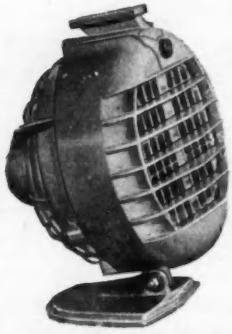

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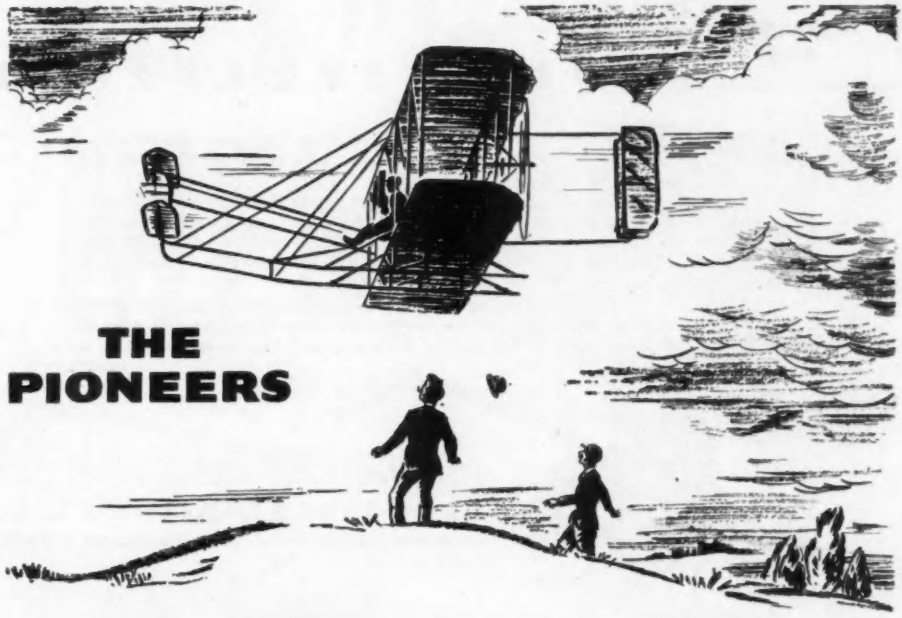

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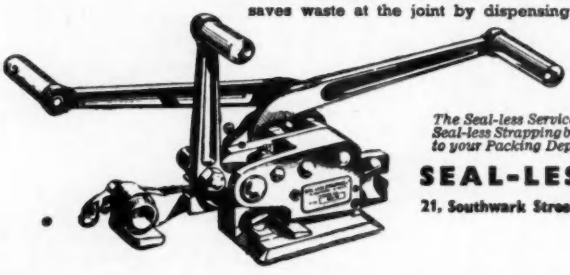

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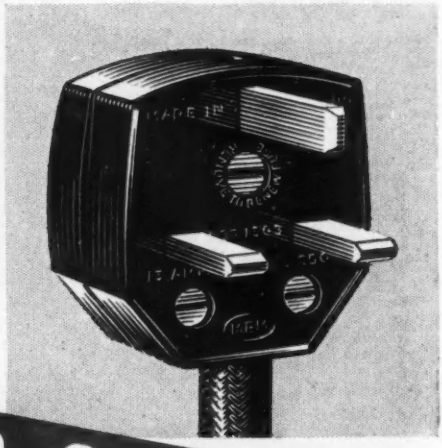

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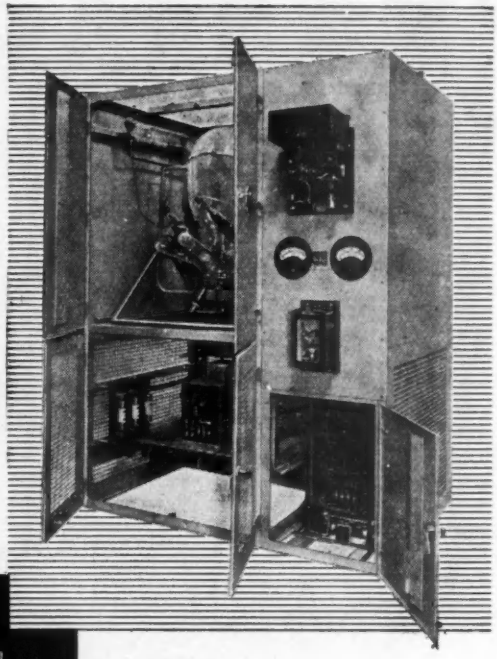

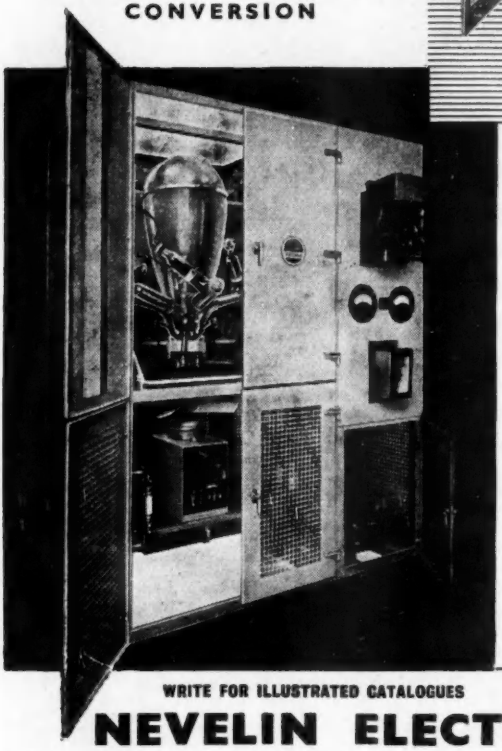

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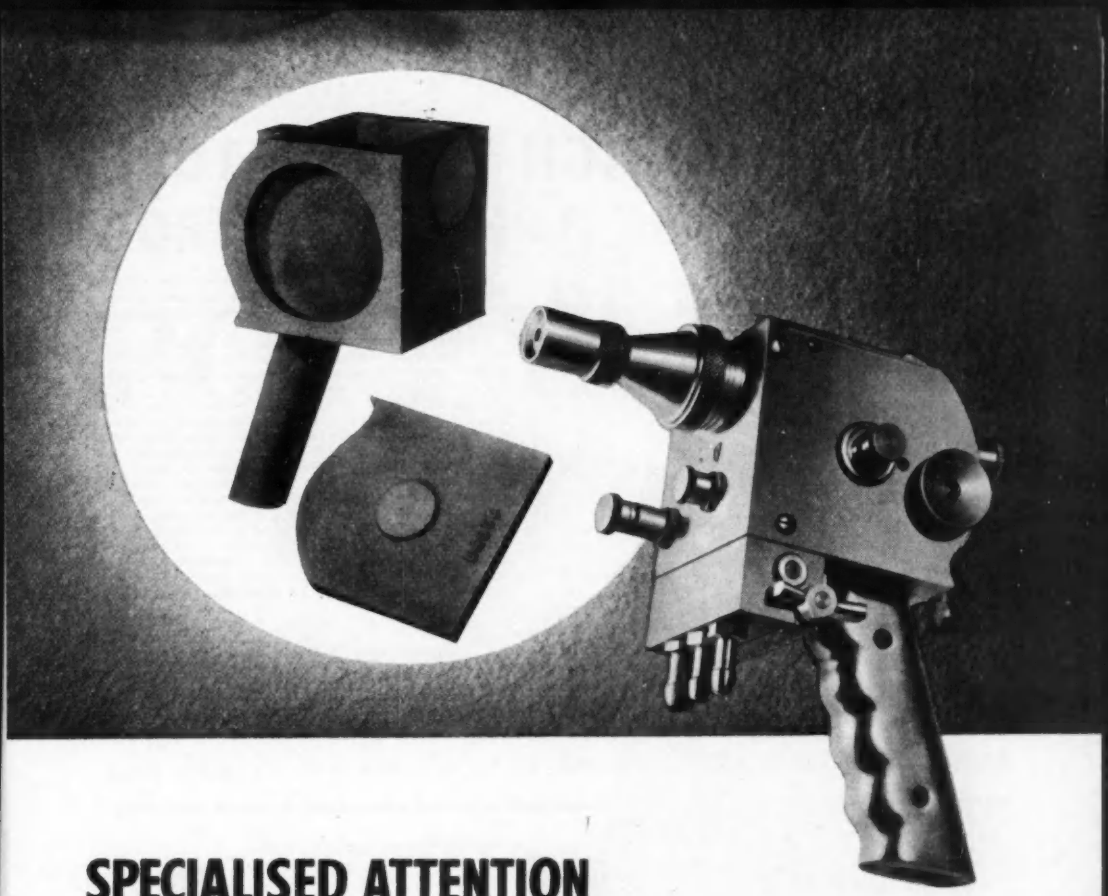

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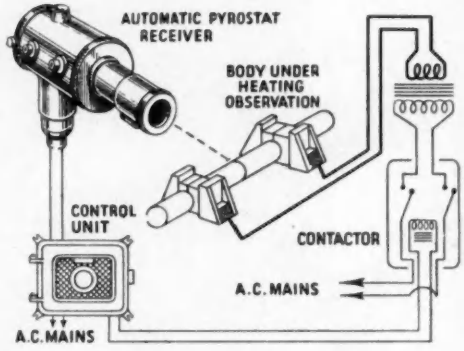

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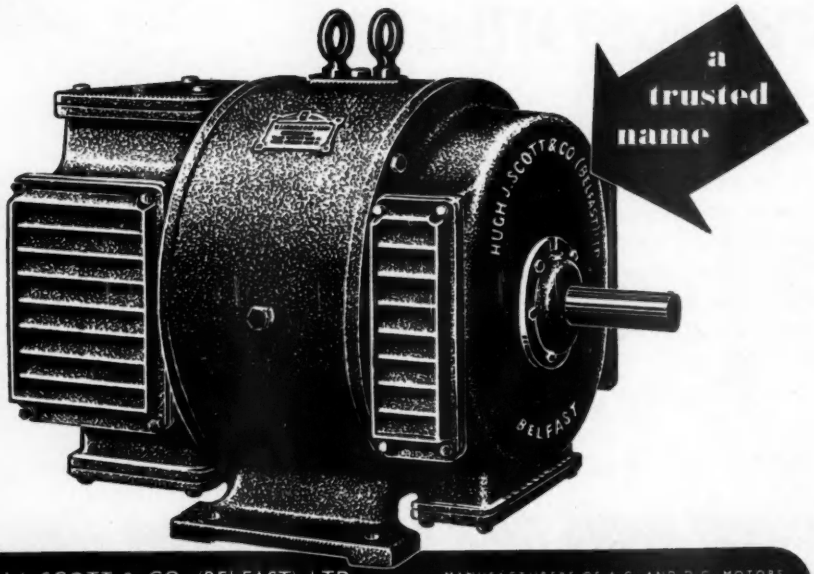

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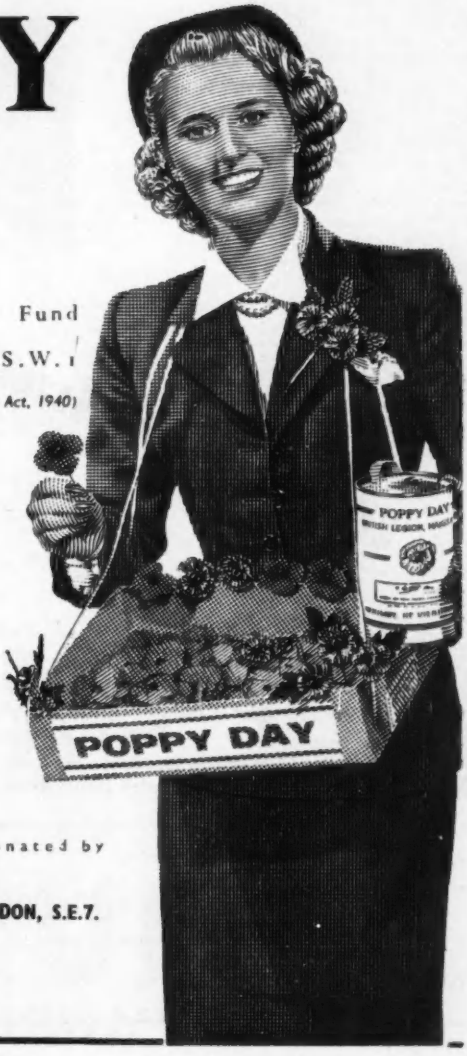

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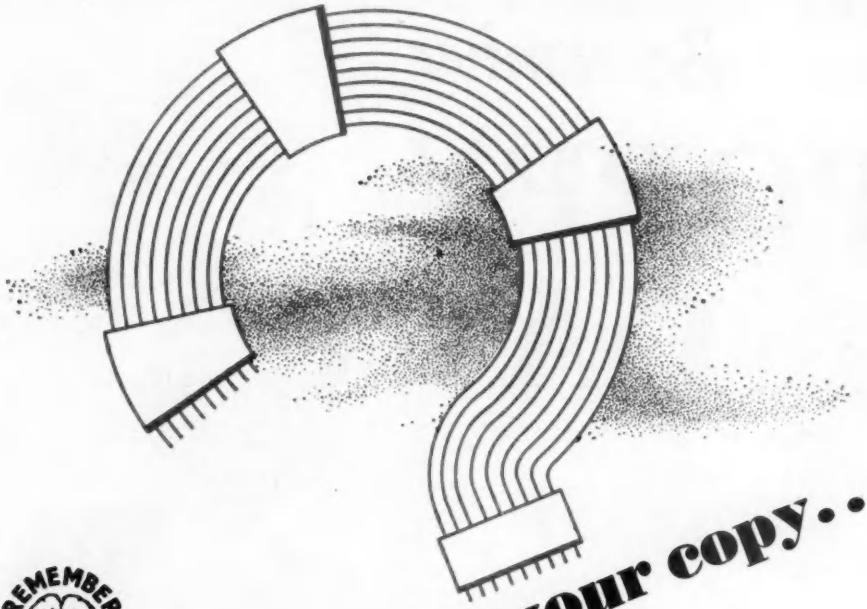

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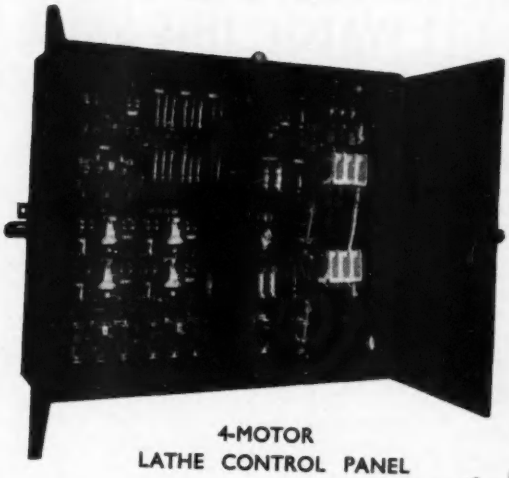

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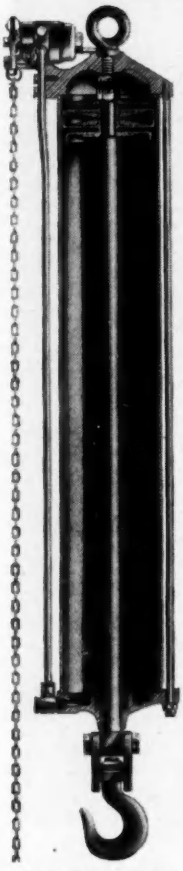

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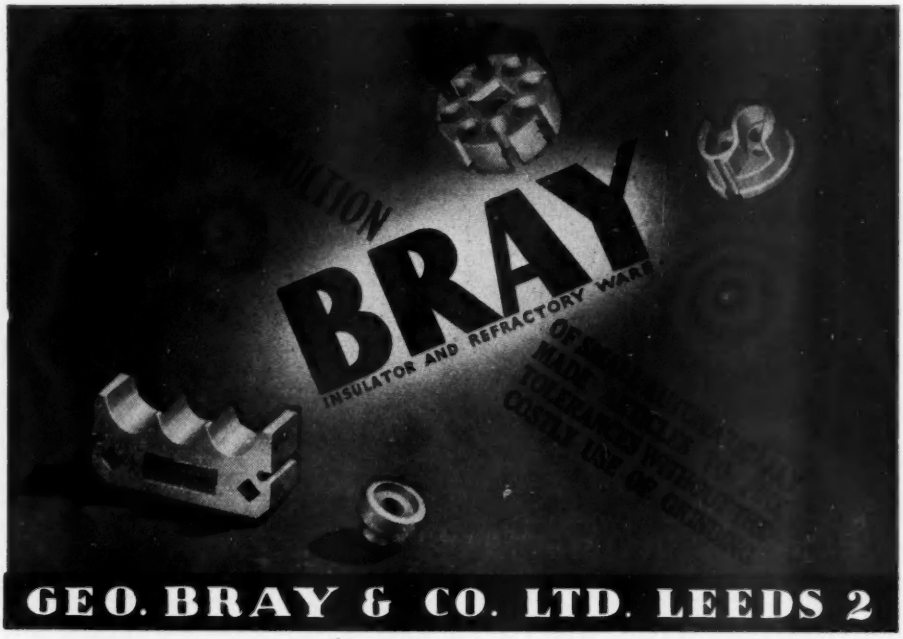

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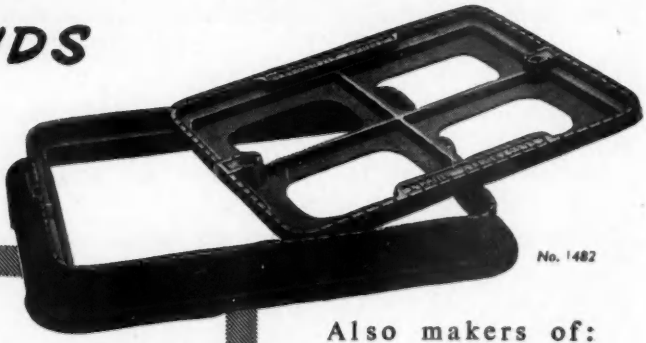

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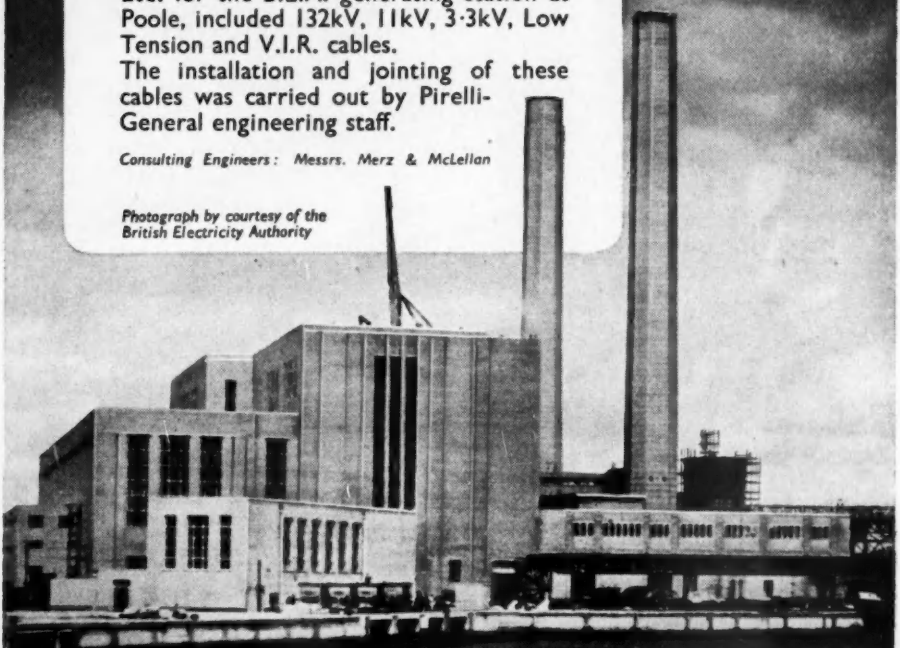

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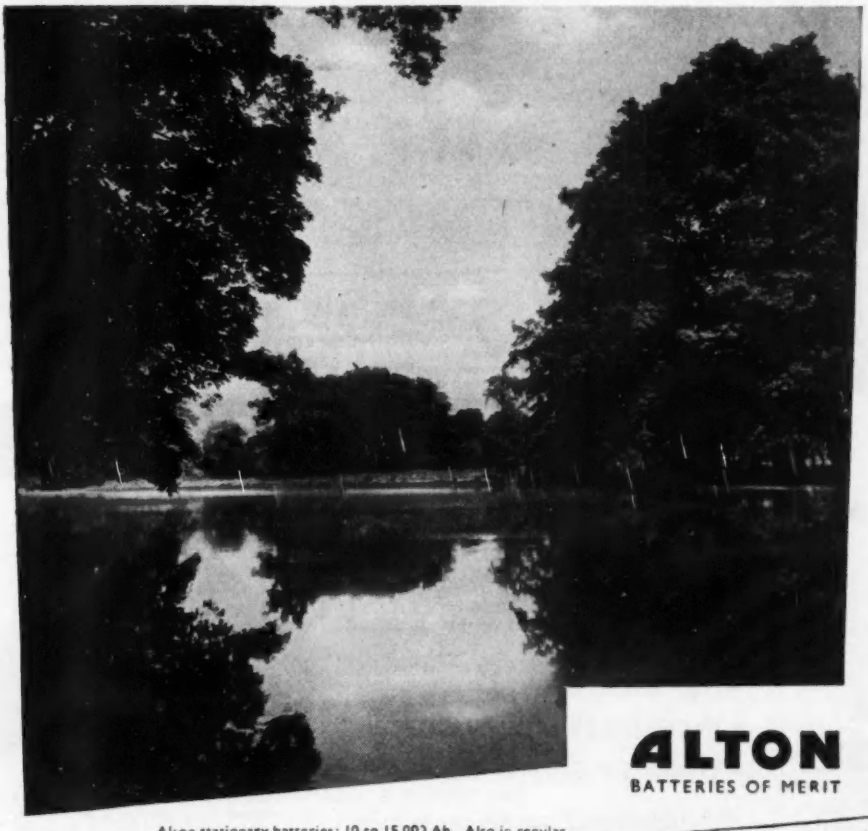

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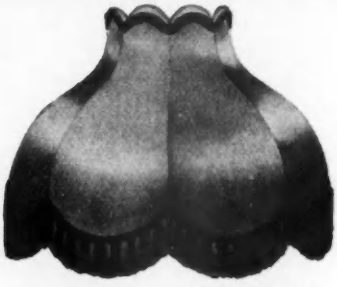

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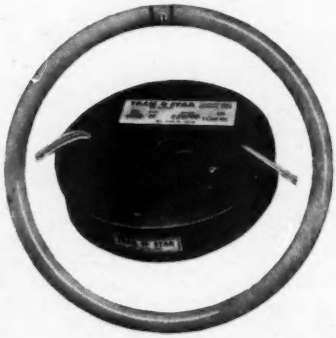

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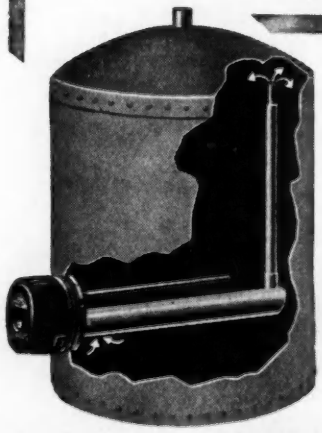

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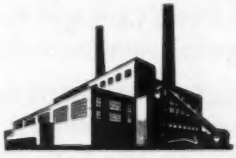
Care still needed

All this is good news; but care is still needed. If the coming winter is a hard one — unlike last year's mild winter — there is still a danger of overloading the available plant, with resulting inconvenience and loss of production in the factories. That is why the general public are still being asked to co-operate by going easy with their electricity in the early mornings and late afternoon, particularly on cold days.

To reduce yet further the risk of interruption, Industry is asked to ensure that it makes the most efficient use of power. If all play their part, both in industry and in their homes, the nation can benefit by all the advantages of increased production and improved amenities that the electrical age has in store.

For more production—Use power WISELY!



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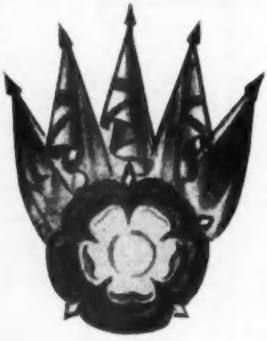

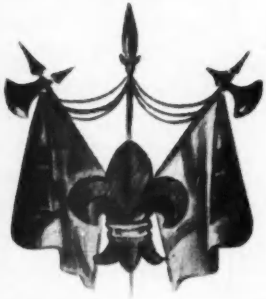

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G.E.C.

REMEMBER POPPY DAY

TURBO PLANT

A 60 MW G.E.C. hydrogen-cooled alternator for the new B.E.A. Power Station at Uskmouth, South Wales, leaving the Company's Engineering Works at Witton.

THE COMPANY HAS CONTRACTS FOR 15 SIMILAR 60 MW GENERATING SETS

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Editorial

ROMAN HOLIDAY

THE parliamentary debate last week on National Fuel Policy was characterised by little policy and even less of national outlook. The stage was set by Mr. Geoffrey Lloyd who unashamedly made it clear that the Government had not yet made up its mind on what it was going to do about the Ridley Report, and he optimistically hoped for inspiration from the debate. Mr. Noel-Baker on the other hand was more constructive, he ostentatiously turned his back on the report and urged "positive and active measures" to make consumers change over from electricity to gas. But there was one bouquet also. He deplored the reduction in load spreading this year with the resulting discouragement of double shift and similar working arrangements. Have we been mistaken all this time in not regarding the B.E.A. as a national benefactor in not pushing ahead faster with new plant so that the need for load spreading will continue to provide the coercion needed to achieve long-hour industrial production? After the inauspicious beginning, the debate limped painfully along as the evening progressed, brightened only by the inevitable diatribe from Mr. Nabarro against the evils of electricity and Treasury officials. He mentally crossed the floor of the House and joined with Mr. Noel-Baker in asking for sanctions against the housewife who uses electricity. But the full significance of the motion before the House escaped nearly all the speakers. They were not discussing the Ridley Report alone, the last annual reports of the nationalised fuel industries had been ungracefully lumped together under the omnibus phrase "taking note." Thus discussion of the last two B.E.A. reports has come and gone without the faintest zephyr of wind to trouble the calm waters of Millbank or Winsley Street.

ROMAN TASK

THE denouement of the debate came, correctly to form, in the closing paragraphs, of the closing speech. The Government it was stated, had accepted three of the Ridley recommendations all, of course, concerned with electricity. The B.E.A. is to be allowed to charge proper costs for giving standby supplies, but on the other hand must give up those naughty restrictive conditions in industrial agreements concerning the use of private generating plants. As these restrictions have been in abeyance for the last five years the decision is hardly of a momentous nature. It is with the third recommendation that the fun should start. This requires that maximum demand should be charged on a monthly basis and not on the annual demand as at present. We have always felt that this particular recommendation of the Ridley Report was something of an afterthought, since, in a well-reasoned report, this view was accepted without discussion of its implications. Its acceptance in turn by the Government we can only attribute to the use of the proverbial pin. It is food for idle thought to wonder how the Boards will achieve this supposedly desirable goal with its curtailing of peak loads in summer equally with winter. As its direct implementation will involve a loss of revenue consequent upon the lower average demands, an all-round increase in m.d. charges would seem to be necessary to restore income to the previous level. Even this increase, however, will give far less encouragement to the consumer to keep down his peak in the critical winter months. Will the answer be found in a Heath Robinson variation of the rate of m.d. charge month by month or will the B.E.A. oppose the Government's acceptance of this recommendation and take a stand on its statutory obligation to simplify tariffs?

THREE THEMES

INCREASED productivity is no new subject, and its continued topicality is strong evidence of its major importance. E.D.A. did well to gather in London last week a distinguished and influential audience from all sections of industrial and official life, to hear more of the essential part electrification has to play in stepping up our industrial output. After an eventful two days of speeches and discussion, three leading themes remain uppermost in mind. First, the reiterated reminder that the American workman disposes three and a half times the electrical horsepower of his British rival. Then, a natural corollory to this story of a gap to be closed, the considered warning, voiced by Lord Citrine, of the disastrous consequences of unduly limiting investment in generating plant. Finally, in this leading trio—though many other topics fight hard for a place—comes the part the application engineer can play in speeding up industrial electrification. Though the name may be new, the true novelty lies in the extent to which he is to serve industry. Whether employed by supply authority or electrical plant manufacturer, his task is to awaken the industrialist to the assistance that electric power is waiting to give, and to show how this can be provided economically. There seems from the importance attached to this work, reason to hope for a new examination of the status, training and deployment of men suited to fill such a position.

IRISH ACCOUNTING

WHEN the B.E.A.'s last report appeared four weeks ago, it presented an outspoken defence of the Authority's provisions for the depreciation of plant. Now the Eire Electricity Supply Board has tackled the same topic, but with a different conclusion. It has, in the past, made annual payments to a depreciation fund so that the total cost of each item of plant has been repaid by the end of its useful life. This is, of course, the essence of the so-called historical cost method. Faced with the increasing excess of the cost of replacing plant over the funds made available by such a system, the Board has now decided that some special provision must be made. An ingenious method has been found of achieving this without departing widely from established practice. It consists in continuing the annual charges for so long as the plant remains in commission. Thus part of the higher cost of present equipment will be met effectively with the rewards for high standards of maintenance in years gone by.

RURAL SUBVENTION

ANOTHER change in the financial arrangements of the Eire Board draws attention to a further parallel with B.E.A. problems. This is the separation of the revenue account to show its rural and non-rural components, a move considered desirable because in Eire rural electrification is the subject of a State subvention. By the end of March, 1952, £2·5 m. had been advanced as a subsidy for this purpose, out of a total capital invested in the rural scheme, at that date, of £5·2 m. Since 1947, some 59,000 consumers have been supplied and connected, but during the year reviewed, the separate accounts show a loss.

NEW LOOK

A NEW feature always deserves a special welcome to our pages, and so we commend to our readers "An Engineer's Notebook," which appears this week on page 825 and will, we hope, entertain them at intervals in subsequent issues. Contributed by an observer of today's technical scene, it will record some of those by-ways of pure and applied science that so often lead to important developments, and which can always be counted upon to excite our curiosity. The observant reader will no doubt notice that this is by no means the only change in our appearance this week; even the closely packed pages of our financial section adopt a new presentation that adds to a long-established service. Yet these introductions are only more obvious stages in the changes that are continually modifying the ELECTRICAL TIMES to keep it in the forefront of present-day methods and interests.

Meteor

Overhead Line *CONSTRUCTION*

Considerations affecting the selection of Stays and Baulks—by a contributor

IN the majority of overhead lines employing supports other than steel towers, stays are required at angle and terminal positions, although at such positions unstayed "A" or "H" poles are occasionally used on light lines. Strutted poles are also used, but in these cases are usually restricted to positions where a stay cannot be accommodated.

Stay Wire

With very few exceptions stays are made from galvanised steel strand to B.S.S. 183, obtainable in three qualities, 31-ton, 45-ton and 70-ton, these being the ultimate strengths in tons per sq in. of the strand so classified. The quality most commonly used for overhead line stays is 45-ton and the most usual size for wood pole lines is 7/8 s.w.g. (or "7/8's"). For light lines 4/8's strand is also used.

On lines using "P.B." poles, 19-strand stays are usual at heavy angle and terminal positions, and, of course, similar stays must be used on wood-pole lines of large capacity if the use of an excessive number of stays is to be avoided. The use of these large stays may be viewed with some disfavour as they are heavy and difficult to handle and the method of "making-off" is rather more complicated and tedious. However, when the choice lies between using large stays and obtaining wayleaves for four or five small ones, the designer is likely to find himself in the position of the customer of the proverbial Hobson. It is suggested that when more than two 7/8's stays would be required, a larger size should be used.

It is usual to allow a Factor of Safety of 2½ on stays; thus the safe loads for 45-ton quality strands are: 7/8 s.w.g., 5,400 lb.; 19/10 s.w.g., 9,080 lb.; 19/8 s.w.g., 14,150 lb.

"Making-off" Stays

Stays are often secured at the top by means of U-clamps or "Crosby" clips, although some engineers will not permit this and insist on a "make-off." In the writer's opinion a "make-off" is preferable and should always be employed at the lower end of the stay, whatever is done at the top.

A satisfactory method of "making-off" a 19-strand stay is to cut out the seven centre strands, one at a time, while binding them down with the 12 outer strands. Thus while all strands are not wrapped round the main cable (as is the case in a seven-strand "make-off"), those not wrapped round are well bound in and a very strong "make-off" results.

Some engineers dislike wrapping these heavy stays direct round the pole top owing to the crushing effect, and either terminate the stay on straps attached to a through bolt, or use galvanised sheeting wrapped round the pole underneath the stay wire.

When using heavy stays, care must be taken to avoid crippling the pole, and usually a single wood pole will not fully exploit the strength of two 19/8 s.w.g. stays.

Choice of Stays

In deciding whether to use 19/8's or 19/10's stays it is as well to consider the desirability of multiplying stores, and whether the smaller size will be adequate to meet all duties.

For example, if it is anticipated that 0·15 sq in. copper lines may be required, two 19/10's stays will not serve for angles larger than 60° without employing abnormal stay inclinations. If, therefore, it is intended to use a maximum of two stays per pole it becomes necessary to use 19/8's stays at very heavy angles. Also where "H" terminal poles are employed, an even number of stays is required and two 19/8's offers a suitable arrangement. Again where the available space is limited and it is impossible to use stays with small inclinations, 19/8's stays may again be needed.

Having regard to the foregoing it may be decided to limit the stay sizes to 4/8's, 7/8's and 19/8's; the first size being used for l.t. lines and light lines to B.S.S. 1320.

Stay Rods

Stay rods are made from galvanised mild steel of 28/33-ton quality. In the past the type using a bow and ratchet nut was generally used and has given excellent service. A good feature of this type of fitting is the virtual impossibility

of mischievous slackening of the stay, as once the strain is on, the ratchet nut cannot be loosened without the use of special appliances (such as a turnbuckle and clamps or a drawvice), to take the weight off the nut. The shape of the fitting, however, makes the use of "cattle-guards" imperative in positions where persons or animals are likely to knock themselves against the stay.

The tubular type of stay rod called for in B.S.S. 1320 is now very widely used and seems to have superseded the former type for power lines.

The ultimate strength (at the bottom of the thread) based on 28 tons p.s.i., and the working load for a Factor of Safety of $2\frac{1}{2}$ for various sizes of rod, are given in Table I.

TABLE I. WORKING LOAD AND ULTIMATE STRENGTHS FOR STAY RODS

Rod Diam. (inches)	Ult. Strength (lbs.)	Working Load (lbs.)
$\frac{5}{8}$	7,625	3,050
$\frac{3}{4}$	12,700	5,090
$\frac{13}{16}$	15,500	6,200
$\frac{7}{8}$	19,000	7,600
$\frac{15}{16}$	26,450	10,600
1"	34,650	13,850
$1\frac{1}{8}$	43,600	17,500

Comparing these figures with those already given for the wire strand, it will be seen that a 7/8 s.w.g. stay requires an $\frac{11}{16}$ in. rod; a 19/10 s.w.g. stay requires a $\frac{7}{8}$ in. rod; while a 19/8 s.w.g. stay requires a $1\frac{1}{8}$ in. rod, though a 1-in. rod could be used for this stay by sacrificing some 300 lb of stay strength, a sacrifice which seems worth while.

Stay Insulators

On lines using unearthed construction and on all m.v. lines, insulators are fitted in the stays. For h.v. lines the porcelain "loop-type" insulator is in general use.

For h.v. lines using unearthed construction—i.e. wood pole lines having unearthed steelwork—stay insulators used in this country are generally made of wood. B.S.S. 1320 specifies a 2 in. by 2 in. by 6 ft spar to the ends of which m.s. straps are bolted. Arcing horns having a 3 ft 9 in. gap are fitted to the straps. The spar must be of Karri, Jarrah or Gurjun, planed on all faces. The use of oak is specifically prohibited.

To compete with natural wood stay insulators, a laminated wood product* under the name of "Permali" has been developed and is widely used. Permali stay insulators are made in various sizes and lengths and have guaranteed strengths. Those intended for use with 7/8 s.w.g. and with 19/10 s.w.g. stays respectively, are stronger than the stay wire, but that for the 19/8 s.w.g. stay is slightly weaker—having a guaranteed strength of 32,750 lb (ultimate). This, it will be noted, is slightly less than the strength of the 1 in. dia. stay rod, so that if stays using these insulators are to be used the 1 in. rod is that to adopt and the strength of the insulator is the limiting factor in stay tension.

*Readers are referred to the manufacturers, Permali, Ltd., of Gloucester, for further particulars.

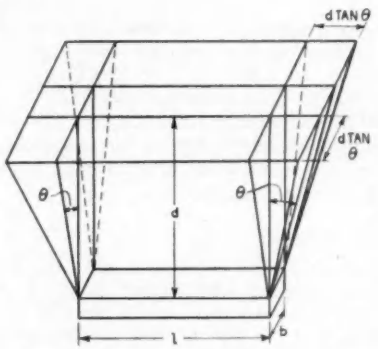


Fig. 1. Geometrical representation for estimating holding power of baulks

Stay Anchors or Baulks

To say that a stay is no stronger than the holding power of its anchor is to state a truism which, however, is liable to be overlooked. Unfortunately the strength of this element of the stay is not susceptible to precise calculation.

Various forms of stay anchor have been devised, but for heavy lines and h.t. lines the timber or reinforced concrete "baulk" holds the field. Various proprietary makes of reinforced concrete baulk are available, most of which are short and broad; a shape which it is suggested is not the most economical. Since, however, permits for soft-wood to use for this purpose are not forthcoming, concrete baulks offer a satisfactory alternative. Hard wood can, of course, be used, but it is difficult—perhaps impossible—to impregnate properly and, so far as the present writer knows, no reliable information regarding its probable life is available.

Holding Power of Baulks

In calculating the holding power of a stay baulk it is usual to assume that it tends to lift the inverted frustrum of a right pyramid of soil resting on its surface. In making the calculation it is generally assumed that the axis of the pyramid is vertical. Obviously such a method of treatment is far from precise; the weight of soil which the baulk is trying to move will be much greater as the inclination of the stay

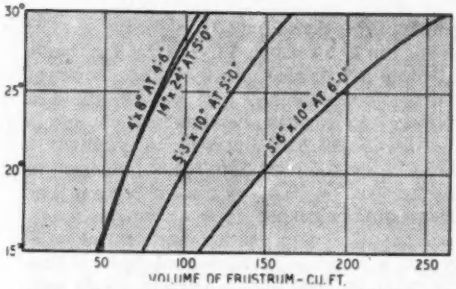


Fig. 2. Volume of frustrum for various baulk sizes and depths plotted against angle of failure

decreases. On the other hand, the relative value of the component of this weight acting in the direction of the stay decreases with decreasing inclination. Other factors which cannot be determined easily are the weight of the soil (it is not a practical proposition to weigh the soil at each stay position and supply a corresponding baulk!), and the angle θ (see Fig. 1) which the faces of the pyramid make with the vertical. While, therefore, this method of treatment leaves much to be desired, it at least provides some basis for calculation.

Considering Fig. 1, it can be seen that the frustrum is made up of a rectangular block of volume dlb, four wedges whose volumes sum to $d^2(l+b)\tan\theta$ and four corner pieces which together make up a pyramid of height d and base area $4d^2\tan^2\theta$ whose volume is therefore $4/3\ d^3\tan^2\theta$.

Accordingly the total volume of the frustrum is given by the expression

$$d(lb+d(l+b)\tan\theta+4/3\ d^2\tan^2\theta).$$

It is sometimes stated that a safe value for θ is 30°, because the angle of repose of most soils is well over 30° to the vertical. This does not appear a very sound argument. It is surely what might be called "the angle of failure," not the angle of repose which is in question. The value of θ has a considerable influence on the result obtained, an influence which is much more marked for more deeply planted baulks. Fig. 2 shows curves of Volume of Frustrum against θ for four sizes of baulk and three depths of planting.

The weight of soil may normally vary between about 70 lb/ft³ and about 120 lb/ft³. If the use of various sizes of baulk for the same size of stay is to be avoided, a conservative value of this and of θ should be chosen. While cases must arise in especially bad ground where extra large baulks will be needed, it is undesirable and unfair that too much should be left to the experience and discretion of the site engineer. Generally the cost of adopting a safe size of baulk is unlikely to be excessive. In the case of solid rock, special steps will no doubt be taken, depending on the hardness and structure of the rock encountered.

Fig. 3 shows "Resistance to Uprooting" plotted against length of baulk for various baulk widths and depths of planting, assuming 90 lb/ft³ as the weight of soil and 20° as a safe value for θ. It is convenient to plot resistance against baulk length as the relation is a linear one for any given width and depth of planting.

Resulting Baulk Sizes

On Fig. 3, vertical lines have been drawn corresponding to the safe tension in 7/8 s.w.g., 19/10 s.w.g. and 19/8 s.w.g. (insulated) stays.

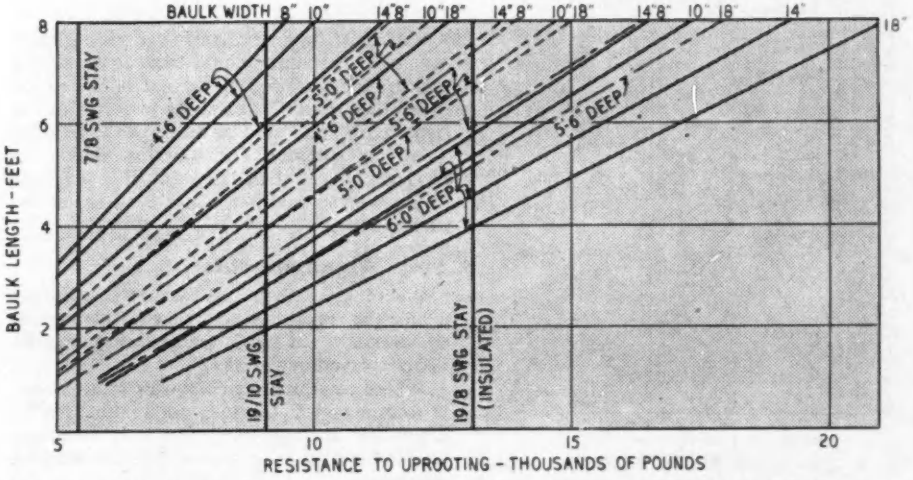


Fig. 3. Uprooting resistance of stay baulks. Basis:—soil weight=90 lb/cu. ft, angle of failure=20°

It will be seen that for the soil conditions postulated, a 7/8 s.w.g. stay requires a 3 ft 9 in. by 8 in. wide baulk planted 4 ft 6 in. deep. Baulk sizes included in B.S.S. 1320 are 2 ft by 8 in. by 4 in., 4 ft by 8 in. by 4 in., and 4 ft 3 in. by 10 in. by 5 in., and while all three baulks are bracketed against both sizes of stay (4/8's and 7/8's), it is reasonable to suppose that the small and medium sizes would be employed in normal and poor ground with the 4/8's stay, and the medium and large size with the 7/8's stay in corresponding ground. In this connection it is interesting to note that if Fig. 3 had included the resistance corresponding to a 4/8's stay this would have required an 18 in. by 8 in. baulk at 4 ft 6 in. deep. The depth of planting is not specified in B.S.S. 1320, but the length of stay rod used suggests that this is at least 4 ft 6 in. Accordingly it is suggested that the compilers of the specification would not consider the figures of 90 lb/ft³ and 20° "angle of failure" unduly pessimistic.

As an alternative to the 3 ft 9 in. by 8 in. baulk at 4 ft 6 in. deep, a 14 in. by 21 in. baulk 5 ft deep is indicated. A size of R.C. baulk commonly used with a 7/8's stay is 14 in. by 24 in. It is likely, however, to be more expensive to install than the longer baulk, even if this is set at the same depth, since it should be remembered that it is not practicable to dig a hole of this depth only 21 in. long.

For the 19/8's stay a 5 ft 9 in. by 8 in. baulk 6 ft deep is indicated. Such a baulk, however, unless abnormally thick for its width, would be too weak to resist the bending moment due to the distributed load upon it. Accordingly a 5 ft 4 in. by 10 in. by 5 in. baulk 6 ft deep, or a 6 ft 10 in. by 10 in. by 5 in. baulk 5 ft 6 in. deep would be needed. The latter baulk would require stiffening by using a short central baulk behind it, and it is recommended that a stiffening baulk be used with a 5 ft 6 in. baulk also.

On the basis of the above and of Fig. 3, it is suggested that the baulk arrangements in Table II be adopted as normal, while larger sizes must be used in special cases where unusually bad ground is encountered.

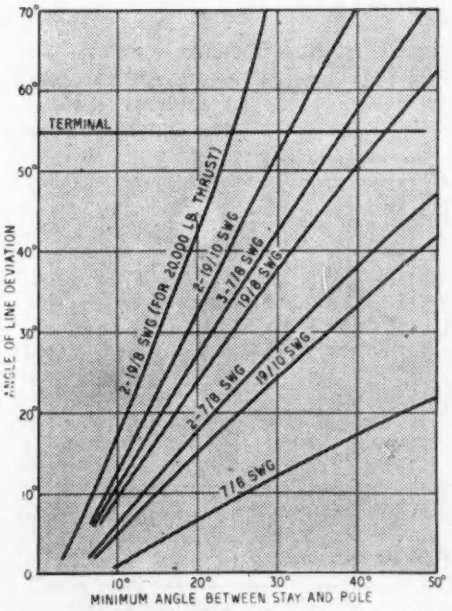


Fig. 4. Stay angles for 0·1 sq in. h.d. copper 3-phase line (horizontal formation)

TABLE II.—SUGGESTED BAULK SIZES

Stay Size	Baulk Size	Planting Depth
7/8 s.w.g.	4 ft. by 8 in. by 4 in. or 14 in. by 24 in.	*4 ft. 6 in. 5 ft.
19/10 s.w.g.	5 ft. 3 in. by 10 in. by 5 in. or 18 in. by 27 in.	5 ft. 5 ft. 9 in.
19/8 s.w.g.	5 ft. 6 in. by 10 in. by 5 in. with 18 in. by 8 in. by 4 in. stiffener	6 ft.

NOTE.—Depths given are to the centre of the upper face of the baulk.
*Increase to 5 ft. in case of doubt.

As an illustration of the effect of the value of the "angle of failure," a calculation for ground weighing 100 lb/ft³ having an "angle of failure" of 15° shows that a 10 in. baulk for a 19/8's stay should be 7 ft 6 in. long at 6 ft depth. On the other hand, if the weight is 90 lb/ft³ and the "angle of failure" 25°, a 10 in. by 3 ft 6 in. baulk at 6 ft deep will suffice for this stay.

Installation of Stay Baulks

When installing stay baulks it is most important that the baulk should bear against solid undisturbed ground. To that end the side of the excavation should be carefully undercut at the right depth and at the correct angle to provide a bearing surface. The stay rod should be properly aligned with the point of attachment to the pole so that it will not bend under the stay tension.

Stay Arrangements

Where more than one stay is required at a pole the stays may be arranged side-by-side or vertically. In the latter case they may be either splayed or parallel.

Where possible the side-by-side arrangement is recommended, but it is not suitable for all conductor arrangements, and it is obviously unsuitable where two stays of different sizes are employed.

At heavy angle positions on lines using a triangular formation—or carrying an underrunning earth-wire or pilot cable—the pole may need staying at two or more points if excessive bending is to be avoided. Such an arrangement does not lend itself to placing the stays side-by-side unless three stays are to be used.

Where a vertical arrangement is adopted then the splayed formation is preferable to parallel. The difficulty with the vertical arrangement is that the upper stay is pulling against ground disturbed or weakened by the excavation for the lower stay. Since with the vertical splayed method the anchors may be placed well apart, this difficulty is not so acute. It is, of course, appreciated that this will normally result in an increased inclination of the under stay, but this is regarded as the lesser evil. Where the stays are of different sizes it is usually preferable to place the heavier stay uppermost.

With a side-by-side formation the stays should be splayed sufficiently to avoid overlapping of the earth "pyramids". For the value of θ suggested this means, the ends of the baulks should be $0{\cdot}8d$ apart. Thus for a 6-ft baulk at 6 ft deep the centres should be 10 ft 9 in. apart.

Since with the side-by-side method neither stay is directly in line with the load, allowance must be made for this when calculating stay tensions. Obviously the necessary allowance will depend upon the height of the pole and the inclination of the stays, being less for taller poles and increasing with stay inclination. For most cases, however, if the permissible stay tension is multiplied by a factor of 0·95 when calculating necessary minimum inclinations this will provide ample allowance. For stay inclinations greater than 75° a factor of 0·9 should be used.

Stay Inclinations

It is convenient to measure stay inclinations by stating the angle between stay and pole (thus a large inclination corresponds to a small angle).

If "P" is the applied horizontal load at the point of attachment of the stay, "T" the permissible stay tension and φ the minimum permissible angle between stay and pole.

$$Sin\ \varphi = \frac{P}{T} \text{ for a single stay.}$$

If a two-stay side-by-side arrangement as (1) is used then applying the factor 0·95 to T

$$Sin\ \varphi = \frac{P}{2T \times 0{\cdot}95} = \frac{P}{1{\cdot}9T}$$

For lines employing horizontal formation the stays should be attached to the pole immediately below the cross-arm and P may be considered as equal to the actual applied load, including windage on the lines. For other arrangements it will be necessary to calculate the value of P according to the positions of the conductors and stay attachment.

Where stays employing a vertical arrangement are used the calculation of permissible loading becomes more complicated. If the arrangement is splayed the stays have different inclinations. If attached to different points on the pole they may theoretically be required to

TABLE III.—ANGLES OF DEVIATION AND STAY INCLINATIONS FOR 0·1 SQ. IN. COPPER LINE (HORIZONTAL FORMATION)

Angle of Deviation θ	2°	6°	10°	15°	20°	25°	30°	35°	45°	50°	60°	70°
Sin $\theta/2$	0·0175	0·0523	0·0872	0·1305	0·1736	0·2164	0·2588	0·3007	0·3827	0·4226	0·5	0·5736
$2T_L$ *sin* $\theta/2 = 5872$ *sin* $\theta/2$ ...	102·5	307·5	512	766	1,018	1,270	1,520	1,760	2,250	2,480	2,935	3,365
$2T_L$ *sin* $\theta/2 + wL = p$ ...	373	577·5	782	1,036	1,288	1,540	1,790	2,030	2,520	2,750	3,205	3,635
$P = 3p$	1,119	1,730	2,346	3,108	3,864	4,620	5,370	6,090	7,560	8,250	9,615	10,915
Sin ϕ for single 7/8's ($T_s = 5{,}400$)	0·207	0·320	0·435	0·576	0·715	0·855	—	—	—	—	—	—
$\phi°$	12°	19°	26°	35½°	45½°	58½°						
Sin ϕ for 2—7/8's	0·115	0·178	0·242	0·304	0·376	0·451	0·524	0·593	0·739	—	—	—
$\phi°$	6½°	10°	14°	18°	22°	27°	31½°	37°	47½°			
Sin ϕ for 3—7/8's (Factor 0·9)	—	0·119	0·161	0·214	0·265	0·317	0·369	0·419	0·520	0·566	0·66	0·75
$\phi°$		7°	9½°	12½°	15½°	18½°	22°	25°	31½°	34½°	41½°	48½°
Sin ϕ for single 19/10's ($T_s = 9{,}080$)	0·123	0·191	0·258	0·342	0·425	0·508	0·591	0·659	0·812	—	—	—
$\phi°$	7°	11°	15°	20°	25½°	30½°	36½°	41½°	54°			
Sin ϕ for 2—19/10's	—	—	0·144	0·191	0·237	0·268	0·311	0·353	0·439	0·478	0·558	0·633
$\phi°$			8½°	11°	14°	15½°	18½°	21°	26°	28½°	34°	39½°
Sin ϕ for single 19/8's ($T_s = 13{,}100$)	—	—	0·179	0·238	0·295	0·353	0·41	0·465	0·578	0·63	0·735	0·833
$\phi°$			10½°	14°	17½°	21°	24½°	28°	35½°	39½°	47½°	56½°
Sin ϕ for 2—19/8's	—	—	—	0·132	0·164	0·196	0·228	0·245	0·304	0·332	0·387	0·44
$\phi°$				7½°	9½°	11½°	13½°	14½°	18°	19½°	23°	26½°
Tan ϕ_{min} = P/20,000	0·056	0·086	0·117	0·156	0·193	0·231	0·269	0·304	0·379	0·412	0·481	0·545
$\phi°_{min}$	3°	5°	7°	9°	11°	13°	15°	17°	21°	22½°	26°	28½°

exert different forces thereon, and this will in any case be the position where the stays are of different sizes. Before any attempt can be made to calculate minimum inclination it is necessary to decide upon the "splay" to be allowed. It is suggested that at ground level this should not be less than the depth of planting, while a value of 1·4 times this depth is preferable.

In practice, however, the most careful calculations for this kind of arrangement may be frustrated by imperfect adjustment which leaves one stay to carry far more than its proper share of the load.

Calculation of Stay Inclinations

If the angle of line deviation is θ and the maximum permissible line tension is T_L the resultant load due to one line is $2T_L \; Sin \; \frac{\theta}{2}$

To this must be added the wind load corresponding to the worst assumed conditions of loading, which equals wL where w is the windage per foot of loaded conductor and L is the maximum design span. As, however, the windage normally forms a small part of the total load the value taken for L is not critical.

For "n" conductors the total load P becomes

$$n\,(2T_L \, Sin \, \frac{\theta}{2} + wL)$$

and if T_s is the maximum permissible stay tension then from the previous equations:—

$$\frac{n}{T_S}(2\,T_L \; Sin \, \frac{\theta}{2} + wL) = Sin \; \varphi$$

for one stay whose point of attachment is level with the load, and

$$\frac{n}{1{\cdot}9T_S}(2T_L \; Sin \, \frac{\theta}{2} + wL) = Sin \; \varphi$$

for two stays in side-by-side formation also attached at load level.

Practical Example

As an example let it be assumed that a 0·1 sq in. (7/·136 in.) H.D. copper 3-phase line, having conductors arranged in horizontal formation and using spans of about 350 ft is to be erected, the stays being attached immediately below the crossarm and therefore sensibly level with the load.

Assuming loading with El.C. 53, $\omega = 0{\cdot}772$ lb/ft, so that $\omega L = 270$ lb.

The maximum permissible line tension T_L is 2,936 lb and for an angle of deviation of 30° $Sin \; \frac{\theta}{2} = 0{\cdot}2588$.

Thus $n \; (2T_L \; Sin \, \frac{\theta}{2} + wL) = 3 \; (2 \times 2936 \times 0{\cdot}2588 + 270)$ lb $= 3 \; (1520 + 270) = 5370$ lb.

φ, the minimum permissible stay angle for a single 7/8's stay is given by

$$Sin \; \varphi = \frac{5370}{5400} = 0{\cdot}995,$$

so that obviously this stay will not serve.

For 2 – 7/8's stays in side-by-side formation

$$Sin \; \varphi = \frac{5370}{1{\cdot}9 \times 5400} = 0{\cdot}524,$$ from which $\varphi = 31\frac{1}{2}°$.

For 1 – 19/10's stay ($T_S = 9080$ lb.)

$$Sin \; \varphi = \frac{5370}{9080} = 0{\cdot}592;$$ and $\varphi = 36\frac{1}{2}°$.

While for 1 – 19/8's stay with Permali insulator ($T_S = 13100$ lb.)

$$Sin \; \varphi = \frac{5370}{13100} = 0{\cdot}41$$

and $\varphi = 24°$.

Table III gives values of φ for the three sizes of stay for various angles of deviation. Where φ is less than 15° with a two-stay arrangement the reduction factor of 0·9 has been used. The results are shown plotted in Fig. 4 but the step in the curves resulting from the change of factor has been smoothed out. These curves only apply, of course, to 0·1 sq in. copper lines arranged as stated above.

Crippling Effect on Poles

As mentioned earlier it is necessary, when using heavy stays to consider the crippling effect on the pole. Unfortunately there is some difficulty in determining an appropriate value, as widely different results for crippling loads can be obtained according to the formula chosen and the values of the constants used. The height of the pole will also have a considerable influence on the result and where unusually tall poles are employed at heavily stayed positions this matter should have careful attention.

For stout poles of the height commonly in use it is suggested that a safe limit for permissible thrust in the pole is 20,000 lb.

If C equals the thrust tending to cripple the pole, $\frac{P}{C} = tan \; \varphi$, which sets a lower limit to φ for *any* size or number of stays.

$$\text{i.e. } \varphi_{min} = tan^{-1} \frac{n \; (2T_L \; Sin \, \frac{\theta}{2} + wL)}{20{,}000}$$

Values for φ_{min} are also included in Table III, and the resultant curve plotted in Fig. 4.

It will be noted that on this basis φ_{min} exceeds the permitted inclination for 2 – 19/18's stays, so that, as previously mentioned, a single pole will not fully exploit the strength of these stays.

POWER FOR PRODUCTIVITY

London Conference Highlights

New E.D.A. Development Campaign

IN modern industrial conditions, the greater mechanisation that is a necessary forerunner to increased productivity demands increased electrification. This fact has been kept well to the fore by the Electrical Development Association recently, and the latest move has been the organisation of an Industrial Productivity Conference, which was held at I.E.E. headquarters last week. This was attended by some 500 industrialists and others interested in the problem.

At the first session, DR. P. DUNSHEATH (president, E.D.A.) took the chair, and in his introductory remarks suggested that there could be no surer foundation for building up productivity than "that well worn, but still eloquent theme a cheap and abundant supply of electricity." He then called upon Mr. A. R. W. Low (Parliamentary Secretary to the Ministry of Supply) to address the conference.

Too Little and Too Much

In his speech, Mr. Low said that we in this country suffered from having to try to make too little do too much. The Government had to see that the "too much" was kept within bounds. Productivity increased from 1947 to 1950, but in 1951 new difficulties arose. The switchover to defence production of a large part of the metal industry caused some dislocation, and scarcity of many raw materials upset the rhythm of production. Now matters were improving; steel was in better supply and of non-ferrous metals only nickel, and perhaps copper, caused major difficulties.

In the United States, the average working man used three times as much electric energy as his British counterpart. Possibly not all this energy was used economically, but it was certain that the main solution to the productivity question depended on the provision of new plant and equipment. He felt that mechanical handling had an important part to play, and in addition he called for a shortening of the time taken to complete the design and development stages on the one hand and actual production on the other.

The stage had been reached in the problem of productivity where there was complete agreement amongst those who had studied the matter and the real difficulty was to persuade others.

Mr. Low, whose theme had been "the national need for greater productivity," was followed by three speakers who dealt with "electricity and productivity." The first of these was SIR NORMAN KIPPING (Director-General, F.B.I.) who treated electricity as the life-blood of production and extended the metaphor to good effect. He emphasised that more power and mechanisation meant more investment, and that it cost a lot of money to use more power. A machine tool driven by a 5 h.p. motor might cost £5,000, and then there was the cost of housing the machine and of providing services. In effect, the usefulness and, to a large extent the usability of power depended on the availability of capital, and that in turn depended on its reward. He said he had no hesitation in saying that the growth of productivity was being directly discouraged by levels of taxation which prohibited saving and offered no rewards attractive enough to encourage experiment and the taking of calculated risks.

Turning to the need for power, he queried whether the country could afford to encourage the domestic consumption of electricity; or to use electric power inefficiently, as was done to some extent. He begged Government, B.E.A. and industry all to continue to work together on these problems. One step that should be taken was the removal of the threat of restrictions against the use by industry of private generating plant. The B.E.A. should not be the final judge on proposals for private generation, though they should take part in consultation.

Electrical Manufacturer

The problem from the angle of the electrical manufacturer was discussed by COL. B. H. LEESON (director, B.E.A.M.A. and president, I.E.E.). He suggested that the placing of 1 kW of electrical power in the hands of a man effectively increased his capability to work ten-fold. An operator on a machine driven by a 10 kw motor was virtually a servo-mechanism directing about 100 times his own capacity for doing

the equivalent work. Today, the services of the chartered electrical engineer were of great value to the progressive firm, and a dire necessity to that which lagged behind.

The electricity supply viewpoint was put most forcibly to the conference by LORD CITRINE (chairman, B.E.A.) who said that not everyone realised that the plant shortage was a result of a Government decision of 11 years ago. The C.E.B. had warned the Government then of probable consequences of restricting plant installation and had been exonerated from subsequent blame though this was not made public.

2,000 MW per year

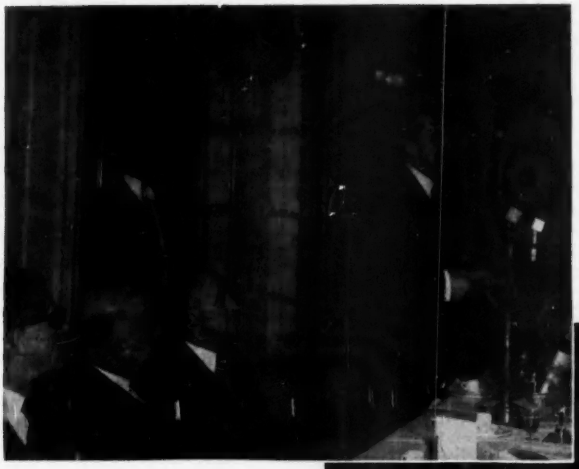
He called on the present Government to help the industry by permitting the installation of 2,000 MW/year. It was the considered opinion of the B.E.A. that if generating plant installation was limited to 1,550 MW, and demand increased at the rate expected, then load shedding would go on indefinitely in severe weather with consequent loss to industry. An adequate supply of electric plant was the only real answer to the call for increased power for the workman in the factory.

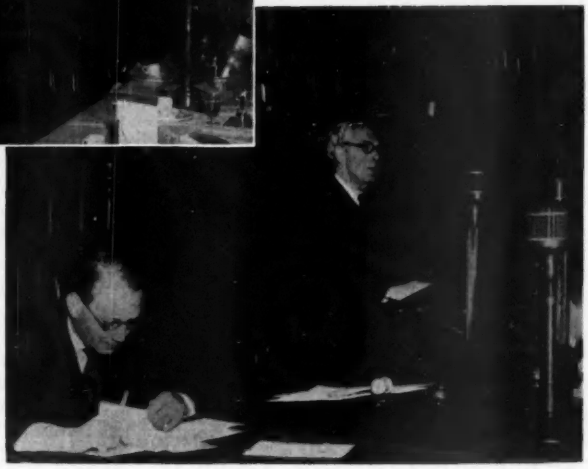
Replying in some degree to Sir Norman Kipping he emphasised that electricity supply was a mass-production industry, and that if the sale of domestic units fell, the cost of industrial units would rise. The industry could not afford *not* to encourage domestic consumption.

Discussion

A discussion on the morning's papers was opened by SIR VINCENT TEWSON (general secretary, T.U.C.) who said that trade union policy was quite clearly in favour of increased productivity. The argument that a man could work himself out of a job was not accepted in the trade union movement. On the contrary, the fear of unemployment and under-employment was a reason for a still greater need for productivity. He thought that the report of the Ridley Committee had cleared the air on many matters, and that it would be a useful family bible for the Ministry of Fuel and Power.

MR. J. O. KNOWLES (Brookhirst Swgr.), speaking in the discussion, emphasised the need for application engineers who could advise different industries. At present such men took something like 12 years to train. MR. J. F. FIELD (B.E.A.) spoke of the coal requirements of an extra 2,000 MW of plant a year. He suggested that the use of "an engine now being planned" (presumably the steam-gas-turbine cycle, in its pass-out form) there would be less coal needed for industrial require-





On the right, Dr. P. Dunsheath (President of E.D.A.) is seen speaking at the opening session of the Conference. Studying his notes is Mr. A. R. W. Low (Parliamentary Secretary, Ministry of Supply). In the photograph above, Mr. Geoffrey Lloyd is seen speaking at the Conference luncheon. Listening (l. to r.) are Col. Leeson, Sir David Maxwell Fyfe and Mr. H. Nimmo

In the front of the audience at Wednesday morning's session were delegates from Northern Ireland. From left to right (seated) they are Messrs. L. Mackie, T. G. Christie (chief engineer, N.I.E.B.), J. E. Jones (sales and development engineer, N.I.E.B.), Sir William Scott (Min. of Finance, Northern Ireland), Mr. D. Andrews and Mr. A. W. Ferguson (chief administrative officer, N.I.E.B.)

ments than today, in spite of greatly increased electricity generation.

At a luncheon held in connection with the conference, the RT. HON. GEOFFREY LLOYD (Minister of Fuel and Power), proposed the toast, "Greater Productivity." He said it was often overlooked that, although the national income had been doubled during the last 50 years, the amount of coal being consumed was only one-third greater. This had been achieved very largely as a result of the tremendous economy in coal resulting from the operation of steam turbines in the generating stations. He felt that we should go up to and beyond the American electrical h.p./head; a small country like ours depended on a really skilful industrial job, and for that power was needed.

DR. DUNSHEATH replied to this toast, and called in particular for increased loading of machines in factories and for a better standard of lighting in small industrial concerns. He called for the provision of more money to buy the power stations and generators which were required. LORD BRABAZON OF TARA, who followed with a typically witty speech, suggested that during the last few years the E.D.A. had been not free-wheeling, but back-pedalling.

A.B. Activities

The afternoon session following the luncheon was devoted to two papers on the electricity boards' part in any productivity campaign. First speaker was MR. E. R. WILKINSON, (commercial manager, B.E.A.), who called for a revolutionary change in the attitude to the use of electricity in factories. He asked for two-shift working as a contribution to the peak problem, and for a systematic pursuit of efficiency in processing and handling by the substitution of electrical machine methods where they were suitable. He specially invited industrialists and engineers to call upon the electricity boards for help and advice.

MR. C. T. MELLING, (chairman, E.E.B.) who followed, spoke of the service the area boards could offer in advising and assisting industrial consumers. For this to be effective, the supply industry had to establish its sincerity in seeking to give this aid. The possibility of giving advice depended very largely on the personal relations of the district officers with the manufacturing industries. Industrial power engineers should not be selected solely for their technical qualities; their personal relationship qualities should be studied first. How his services were eventually used would depend upon the man, but he must not be desk bound.

In the discussion that followed these papers, it was emphasised by Mr. R. H. RAWLL (L.E.B.) that area boards should act consistently in supporting any national campaign that was launched. It was no good finding one board actively supporting the effort, and another lukewarm. It was particularly important that the boards in London spoke with one voice.

Mr. WARREN (S. Wales), wished to see the appointment of industrial power engineers on a sub-area basis, particularly in those

areas which had a strong industrial bias. To influence the smaller industrial concerns, he suggested that a series of exhibitions should be held, preferably at district level.

The general lines to be followed in an E.D.A. campaign for industrial electrification were outlined by Mr. V. W. DALE at Thursday morning's session of the conference. He called for a repetition of the success that attended the campaign to electrify the homes of Britain in the 1930's. One difficulty that had to be overcome was the depletion of the electricity boards sales staff. The boards had to take the campaign into the local branches of engineering institutions, trade associations and schools.

Mr. Dale was followed by members of the E.D.A. staff, who described special aspects of such a campaign.

Our readers' views . . .

Windmill Power

IN the issue of the ELECTRICAL TIMES of October 9, 1952, under the head "Windmill Power," it is said that:—"There were 1,199 windmills in the Netherlands, most of which are used to generate electricity, but during periods of calm the millers had to recourse to the public mains, which they found expensive by comparison."

I have authority from Stichting Electriciteits-Opwekking Door Windmolens, of Hilversum, to state that this paragraph is wrong with regard to the statement that "most of the Dutch windmills are used to generate electricity." Up to the present time only one test mill in the neighbourhood of Leiden supplied a quantity of electric energy to the public main. However, it is expected that within a short time several mills will be adapted to this purpose, due to the activity of the new "Foundation for producing electricity by windmills." The aim of this Foundation is to erect electricity generating plants in approximately 200 Dutch windmills which are already equipped with auxiliary motors, which can be used as asynchronous generators.

Rex Wailes
F.S.A., M.I.Mech.E.
(Hon. Technical Adviser, Windmill and Water Section of the Society for the Protection of Ancient Buildings)

LONDON W.1

Amateur Electricians

I HAVE been a reader of your excellent journal ELECTRICAL TIMES for nearly five years, in spite of the fact, that such as myself, are continually being condemned in your columns.

For my infamous activities I use the following equipment, a.c./d.c. 0-250 V meter, Wee Megger, Neon Tester, insulated screwdrivers, pliers, etc. These enable me to ensure that any repairs I make are tested for insulation; that all switches are in the live side of the mains. Any extensions I have made to my house wiring are in T.R.S. cable (*not flex*) with the buckle clips spaced to I.E.E. regulations and before doing anything of this sort I have always been careful to ensure that the existing fuses will not be overloaded, and I never make 5-amp extensions to the 15-amp power supply, although adaptors are available to do this in spite of the fact that no 5-amp fuses are incorporated. Finally I never attempt anything beyond my humble knowledge of electricity.

I am certain there are many others such as myself who *do* take care and treat electricity with respect in spite of the fact that we are not professional electricians, so why condemn us all. There are amateur photographers, radio amateurs—both good and bad, so why should *all* amateur electricians be bad. In case any of your professional readers wonder why I should own a Megger, may I state that it was originally bought for my amateur radio work.

D. E. Gooch

BRISTOL

Test Lamps

I NOTE that Mr. H. C. Brooks of Coventry writes in your current issue in condemnation of the so-called "test lamp" which was illustrated in the issue of October 16, 1952.

I would like to associate myself with all the comments Mr. Brooks has made; the apparatus illustrated was just about the most lethal piece of equipment which I imagine it would be possible to put into the hands of the maintenance man. I do think that greater care should be taken before publishing information of this sort, and would suggest that the appropriate thing would be for the ELECTRICAL TIMES to publish a disclaimer as soon as possible.

J. H. Groonock
(Chief Electrical Engineer)

THE STEEL CO. OF WALES
ABBEY WORKS

From AN ENGINEER'S NOTEBOOK

Curiosity, I have always felt, is one of the innate qualities of an engineer. Perhaps it derives from that small spark of the scientist which is a necessary ingredient in his make-up or perhaps only from the unbounded enthusiasm for his work that is so characteristic of all those who follow this calling. Whatever may be the factors which lead to this propensity, be they psychological or merely metabolic, it is this curiosity which has been the signpost throughout the grand tradition which we as engineers have inherited. Something of these thoughts flashed through my mind when I was approached with the suggestion that I should write a new feature for the paper. This was planned to describe some of the by-ways of engineering, of those new developments and discoveries which arouse our curiosity even though they be outside our immediate activities. No light task, I felt. And although I agreed to fall in with the idea, I turned a deaf ear to the plea for a fortnightly article. Once every month seemed a surer way of laying the foundation to what I hope will become a regular page of interest for the reader.

* * *

When Dr. C. G. Darwin delivered the Kelvin Lecture in 1940, his audience was enthralled by the story of electrical effects at very low temperatures. He described the weird and unusual magnetic behaviour of materials at temperatures in the region of 5° absolute, but most of all it was the concept of superconductivity that seized our minds. The idea of conductors without resistance, of electric currents travelling round a closed circuit indefinitely, aroused all the awe accorded to perpetual motion in the Middle Ages. But it is now long since we gave up those delightful daydreams of cables filled with liquid helium, that would have no voltage drop and would defy BS cable ratings. In the light of further research, however, these earlier ideas of superconductivity are undergoing revision. It has been found that some metals such as silver and copper not only exhibit a state of superconductivity, but on subsequent lowering of the temperature below about 10° K the conductance starts to fall, very much as the density of water varies on approaching freezing point. Some of the latest research suggests that this reversal in the temperature coefficient of certain metals is due to the presence of minute quantities of impurities. Whatever may be the reason however, it is clear that there is much more work to be done on materials in this almost unknown world near to absolute zero. What the ultimate outcome of this research will be lies in the future many years hence, but we as engineers can console ourselves with the usefulness of the resistance of materials as we know them. Although we may curse its effect on occasion, we have learned to harness it, and many applications of electricity would be impossible without it.

* * *

Water is such a common commodity and such a widespread raw material for power engineering that we have come to accept its properties as a matter of course. True, the problem of dissolved solids is for ever with us, but water itself, in its unattainable pure form, has always seemed to me a most uninteresting liquid, perhaps in more ways than one. The first shock to this simple faith in H_2O came with the discovery of heavy water, derived from the heavy isotope hydrogen. Now, as a result of recent research, it has been found possible to change water into a solid, not in the familiar crystalline form of ice, but in an amorphous state resembling glass. This again is a product of those laboratories concerned with low-temperature research. The possibility of achieving such a state had been visualised from the similar physical and chemical characteristics of water and silica, despite the wide difference in their respective freezing points. The task of obtaining a physical sample of solid amorphous water, however, presented the gravest difficulties in view of the readiness with which water solidifies in the crystalline state. It was only by the rapid cooling of moisture to a temperature of the order of $-100°$ to $-150°$ C that this unnatural state was achieved. Although there are a few reported cases of the production of amorphous water, it seems that so far only one bulk sample has been obtained which permitted a few of its properties to be measured. The results seem most difficult to repeat, so it will be some time before we can expect to hear more of the properties of this extremely rare vitreous state of water.

NO DECISION

—*Government puts off verdict on main Ridley Committee recommendations*

NO final decision has yet been taken by the Government on most of the 40 specific recommendations made by the Ridley Committee in its report on "National Policy for the Use of Fuel and Power Resources." This was apparent from statements made in the House of Commons last week, during a debate held at the request of the Opposition. This debate, incidentally, technically "took note of" the last annual reports of the B.E.A. and the other nationalised fuel power industries.

Minister's Speech

In opening the debate, Mr. Geoffrey Lloyd, the Minister of Fuel and Power, said that the Government wished to have the views of the House on the recommendations before coming to a final decision. He suggested that the report should be considered against a background of an estimated coal output of 260 million tons/year in 10 years' time. He thought that this was quite practicable.

He thought that the mood of semi-desperation adopted by many who discussed fuel problems was unjustified, and he approved the committee's support for continued competition between the fuel and power industries, and the maintenance of full freedom of choice for the consumer. He also welcomed their rejection of the idea of a super-planning board to control the nationalised industries. So far as co-operation between those industries was concerned, he preferred to the committee's idea of a Joint Fuel and Power Planning Board, an arrangement of regular meetings between the Minister and the chairmen of the Boards. He thought that the question of tariffs might be best handled by this method, as well.

Amongst other items which the Minister mentioned was the setting up of an independent fuel efficiency service to take over most of the work of the Ministry's service, and the hall-marking of approved solid-fuel appliances.

Mr. Philip Noel-Baker, a former Minister of Fuel and Power, opening for the Opposition, traced the present improved coal situation to a milder winter and a fall in industrial activity. Turning to methods of coal economy, he advocated electrification of suburban railways and special attention to gas turbine locomotives. He went on to attack the use of electricity for domestic heating, which he said might well be a curse to the B.E.A. in the next two years "as quite certainly it was two years ago." He suggested more positive and active measures to promote the use of gas. As a contributory factor in easing peak problems, he asked for more double-shift working by industry.

While he was not certain about the Ridley Committee's proposal for a tariffs advisory committee, he did welcome that for a joint advisory board. He thought this should consist of the chairmen and deputy chairmen of the Boards, with the Minister himself in the chair. It should meet fairly often, and the Minister should make a public annual report.

Mr. Alfred Robens wound up the debate for the Opposition, and suggested that the Minister showed a lack of enthusiasm for the fuel efficiency drive. He thought that more efficient domestic solid-fuel appliances would not save coal—they would give a higher standard of comfort for the same consumption. For main heating and hot water, he considered that the Minister should say that solid fuel should be used. Also, he thought that some financial inducement should be offered to industrialists who improved their fuel efficiency.

Accepted Recommendations

For the Government, Mr. L. W. Joynson-Hicks replied to the debate. With regard to household fires, he said that fireplaces and grates were not yet being produced to the efficiency (40%) recommended by the Ridley Committee. That Committee's recommendations on more attention to training in fuel technology were being discussed with the Minister of Education. Recommendations applying to electricity boards which the Government had adopted included a monthly basis for maximum demand tariffs, the principle that standby tariffs should directly reflect the costs of administration involved and of connecting and supplying the consumer, and the abandonment of restrictive conditions concerning the use of private plant.

Amongst other contributors to the debate was Mr. Gerald Nabarro, who thought the Ridley report disappointing. He called on the B.E.A. to desist in any endeavour to sell electricity for space or water heating, cooking.

Ministerial Economy

M. of W. Engineers show the way to saving materials in electrical installations

PRACTISE what you preach is a tenet more often offered as a precept than presented as an example. For that reason it is particularly pleasing to find that while the Ministry of Works has been publishing advice on possible methods of economy in the use of materials in electrical installation work,* the engineers of that Ministry have been acting in advance of those methods.

Our contributor "Megohm," in his comments on the economy report, suggested some steps that might be taken to reduce cost by avoiding unnecessarily heavy forms of construction. In the wide range of work they undertake for Government departments, the Ministry has firmly adopted the attitude that there is more to engineering than merely selecting the best, and instructions have been issued for the employment of many such methods as "Megohm" mentioned. Through the courtesy of the Chief Engineer to the Ministry, we are able to summarise here the steps that have been taken in this matter. It will be seen that most of those suggested by "Megohm" for general use have the support of present Ministry of Works practice.

Domestic Installations

A start may be made with domestic type installations. Here the first and obvious step to be taken is the abandonment of steel conduit except for local protection. This has been the rule for some time on housing projects, but it has recently been extended, and in general buildings such as temporary offices and stores likely to be used for less than 21 years are now being wired in t.r.s. cabling. In all cases there is a restriction of cables and switchgear to 250 volt grades where the operating voltage does not exceed this.

So far as circuit arrangements are concerned, there is an overall requirement that full use should be made of composite and mixed circuit fuse boards in conjunction with "all in" tariffs where possible, so that separate lighting and "power" boards are avoided. Circuits are designed for loading to the limits recommended in the I.E.E. Regulations. In this respect an approach has been made to the Institution, as already announced, to permit the up-rating of cables to the figures adopted in the War Emergency Regulations. A similar request is being made for the re-rating of 23/·0076 flexible cords to permit their use for the connection of a 230 V 1 kW appliance with similar adjustments to the 40 and 70 strand ratings to permit 2 and 3 kW loads respectively. An approach is being made to the supply authorities concerned for a relaxation of their requirements, in suitable cases, to avoid the effective wastage of materials involved when a single-phase load has to be balanced on three phases. For lighting and similar installations, group switching is called for where possible, while for points not controllable in this way, ceiling switches are considered to see if a material saving can be effected.

Industrial Work

Some of the economies discussed above can be applied to industrial installations, and there are several more special considerations. Once again, conduit heads the list, this time with an instruction that solid drawn conduit is not to be used except in association with flame-proof gear; welded seam conduit is considered to be satisfactory if properly made, even in hazardous conditions. Consideration is always given to avoiding flame-proof equipment by the device of mounting ordinary gear outside "danger" buildings.

Where heavy or light gauge conduit is used, the minimum size permissible is $\frac{3}{8}$ in., as against the $\frac{3}{4}$ in. minimum formerly specified. Another move to save steel is the omission of armouring from paper-insulated cables on internal installations, except where the cable is liable to mechanical damage. Conduit may be avoided altogether in the case of multiple runs, by judicious use of trunking. It is necessary, however, that careful consideration is given to cable ratings in each case, as a check on overall economy.

As a general factor in the drive for metal economy all tender documents are required to include for the contractor making an allowance for the recovery and disposal of all metallic scrap accruing from his work. So far

* *Economy of Building Materials*: published by H.M.S.O., price 2s. Reviewed in the ELECTRICAL TIMES, 31 July, 1952.

as bonding for earthing purposes is concerned, there is a requirement that copper bonds should be employed only on cable-end sealing boxes where a test shows that the joint is not otherwise solidly bonded electrically.

As an arbitrary rule to give economy in motors, all fixed machines rated at ¼ h.p. and over must be three-phase. Extensions are being sought from supply authorities of the limit above which a motor may not be direct-on-line started. In respect of loading generally, attention is being given to the possibility of using capacitors to avoid rewiring existing circuits, when the power factor is low and additional loads are contemplated.

One of the difficulties faced with the introduction into electrical installation work of economies of the type outlined, is that the reduction of high factors of safety means that better craftsmanship and closer supervision are needed. This is a matter that has the close attention of the M. of W. engineering division.

Smaller Cables

For example, there may be a case for the adoption of 1/·044-in. as a minimum size for v.r.i. cable, instead of the 3/·029-in. now specified.

All in all, considerable savings should result from the consideration of such standards as those given when specifications are being prepared. They form, however, only part of the drive for economy. Their successful application depends on the support of all concerned with electrical installation including designer, supervisor, contractor, and skilled workmen.

INCREASED CONSUMPTION IN EIRE

ONCE again the report of the Eire Electricity Supply Board, for the year to March 31 last, shows a big increase in consumption for general heating, cooking and water heating, which is attributed to night storage heating. This was the result of the shortage and high price of other fuels. In all some 123 million units were used for heating, cooking and water heating—an increase of 24·2% over the corresponding figure for the previous year which itself was 37·7% up on the 1950-51 total. During the financial year just ended the Board sold a total of 835·3 million units, an increase of 8·4%. Obviously the rise would have been much higher but for the imposition of restrictions on consumption which applied for many months.

Particular difficulty in maintaining supply was experienced early in the year, when the load was some 30% above that for the previous period, and water storage serving the hydro-electric plants had been drawn down much below normal.

Small Surplus

The surplus from the sale of electricity was only £962 for the year, but the profit on merchandise and installations trading amounted to £45,938. The small surplus on energy sales, despite an increase of 0·3d. per unit on tariffs, was due to fuel costing an extra £912,252.

A further 29,367 consumers were connected, of whom 18,067 were rural, making the grand total at March 31 last 372,743.

In the rural electrification programme, which is State subsidised, 49 areas were completed, the capital expenditure amounting to £1,341,924. Sales of current at 50·8 million, were more than double the previous year's figure, and the revenue earned under the scheme was £622,193, of which £285,149 came from fixed charges and £337,044 from unit charges.

On the generation side total output was 1,029 million units, of which the hydro stations contributed 456 million and the steam power stations 573 million units. During the year the first 20 MW set was brought into commission at the Allenwood peat-fired station, together with the initial 22·5 MW set at Cathaleen Falls, where a second similar unit was put into operation a few weeks ago. It is stressed, however, that the full output from the Erne scheme will not be available until the works associated with water storage and regulation, to be carried out in conjunction with Northern Ireland, have been completed.

It is expected that the extension of the North Wall oil-fired station, Dublin, where two 16 MW sets and two Velox boilers are to be installed, will be completed next year. In all, the Board has some 301·5 MW of new generating plant in various stages of design and construction; installed capacity at March 31 was 308 MW.

Arising out of this programme, attention has been given to the problems associated with power transmission from generating stations sited on the midland and western bogs to the main load centres in the east, and advisability of adopting some higher transmission voltage than the present 110 kV is under investigation.

SEAM FRACTURES in riveted boiler drums

Their cause and cure discussed

by SYDNEY D. SCORER, A.M.I.Mech.E.

SINCE the widely-publicised explosion in 1949 of a water-tube boiler drum, engineers in charge of this type of boiler have shown considerable interest in the drum seams of their respective plants. During the past three years, many drums have been subjected to rigorous tests, designed to prove or disprove the presence of fractures, and while most have been found to be in good order, defects of various kinds were discovered in a few. Sufficient, at any rate, to justify perseverance in the search.

Although the York explosion was attributed to intergranular or caustic cracking, it must not be overlooked that there are other and older causes of fractures. Any riveted seam, if sufficiently stressed, is likely to fail in one of several ways. In modern boilers there is comparatively little risk as all are designed according to certain well-proved constructional rules. In older boilers, however, there is always a possibility, that due to slight local distortions caused by years of service, some parts of the seams may be slightly more stressed than others, thus providing conditions for the initiation of minute cracks.

That this effect obtains is evidenced by the very occasional mild and apparently inexplicable leakages which sometimes start at the lap edges of a longitudinal seam, and which can be easily remedied by lightly caulking the area. The seam has "given" and the excess of load has been distributed into the body of the plate.

Manufacturing Defects

At one time, boilermakers found it difficult to roll the butting edges of a relatively small boiler drum to a true cylindrical form, and resorted to dubious expedients to achieve the proper shape. Sometimes, too, the butt straps had not the same curvature as the drum to which they were fitted, and had to be forcibly bedded in place during the riveting process. The consequence of either of these malpractices was work-hardening of the material, loss of some of its ductility and its subsequent susceptibility to failure when subjected to a little more than the normal stress.

It is many years since that sort of practice was stamped out in reputable boiler-shops, but where old boilers are concerned the point should be kept in mind. Over these factors the engineer in charge has no control except that of constant vigilance, but there is another which lies completely within his province.

Seam Leakage

In some of the older forms of seam, the proportions of rivets, rivet pitches and so forth are not quite up to modern standards, and the bedding of the plates (especially in lap joints) was perhaps not quite so exact as we should prefer them to be nowadays. Occasional seam leakages in such boilers are thus unavoidable, but usually can be stopped by light caulking.

When a length of seam leaks persistently, however, and tests to be described later have shown that no fractures are present, it is begging for future trouble to pass from light to heavy caulking. The last mentioned, merely takes the ductility out of the plate until the edge buckles, a plane of high bending stress develops along the nearest line of rivet holes (setting up cracking conditions), and a groove or stress-raiser is formed in the under-plate at the lap edge. The remedy for persistent leakage is to assess the strength of the various seam components and, if possible, re-rivet the affected length with slightly larger rivets.

That advice is important in connection with the older type of boiler drum provided with inwardly-dished endplates. In these only one lap edge is available for caulking, and only this and the clamping effect of the rivets prevents leakage. If leakage develops at the seam edge, little can be done to the rivets to stop the leakage, so the pneumatic caulking tool is brought into play. The shell and endplate laps are literally forced apart (although the distortion is hidden by the strip of metal burred down by the caulking tool), and fractures along the plane of the rivet holes are only a matter of time, depending upon the number of applications of the tool.

As already remarked, defects arising from heavy caulking are within the province of the

engineer in charge. So, to perhaps a lesser extent, are caustic embrittlement fractures.

The conditions favourable to this kind of defect are fairly well known, and it is almost certain that it occurs under a combination of stress and chemical action. One widely-accepted hypothesis is that a concentrated solution of sodium hydroxide accumulates under the laps of a seam. The solution is ready to react with any portion of the plate stressed beyond the yield point of steel, and when it does an intergranular crack results. Once a minute crack has formed, its base probably becomes anodic to the surrounding structure and concentrated attack takes place.

At one time it was thought that caustic embrittlement always gave warning of its presence by the shedding of occasional rivet heads or by persistent seam leakage, but these warnings are not always present. There was a lack of visible indications before the York explosion, and one has personal knowledge of a longitudinal seam in which the plate along one line of rivet holes was fractured almost from end to end without evincing more than moderate leakage.

Nevertheless, it is advisable to apply a hydrostatic test to a water-tube boiler at specified intervals to ensure that no major defects are developing. A record must be kept of the location and severity of any leakages, and these, if they cannot be repaired by a light caulking, must be viewed with suspicion. Small, almost unnoticeable beads of moisture at rivet heads or at seam lap edges also require further investigation, as they may be the external indication of an internal crack. Thus the hydrostatic test should be utilised to find possible defects, after which further examination by special appliances if necessary.

A non-destructive test is, of course, desirable and of these the best and probably the most expensive is examination by X-rays. By that method all the seams of a drum can be radiographed and the presence of fractures can be established beyond all reasonable doubt.

Non-Destructive Testing

Within recent years, since radio-active isotopes became available from the Atomic Energy Research Establishment at Harwell, gamma-rays have been applied to the detection of seam fractures. The method has a number of advantages over X-rays, i.e., in regard to portability and relative cheapness, and it gives satisfactory results. All but the very finest cracks can be seen on the resultant negative, and if periodical gamma-ray examinations are made, any crack can easily be detected long before such time as it may become dangerous.

Another method of non-destructive testing is by means of ultrasonic waves. The waves are produced in a special appliance, and when focused on a seam under suspicion they are reflected back on to a cathode-ray tube. If no cracks or fractures are present the line on the tube screen does not deviate from the straight, but when a break in the metal is encountered a peak shows up on the screen. In the hands of a skilled technician this type of appliance is very useful and is being widely used by leading water-tube boiler operators.

Magnetic Detection

For the smaller plant or for installations where only occasional tests are required, a cheap and effective way of making them is to use a magnetic crack detector. This consists of a copper rod connected at one end (through a switch) to a transformer capable of giving about 500 amps, at two to three volts, and at the other to the return by means of a detachable welder's clip. The method necessitates the removal of rivets where fractures are suspected, and the cleaning of the hole bores. The rod is then inserted centrally in the hole, the clip is connected to the free end and the current is switched on. While it is flowing, the hole surface is sprayed with a suspension of iron filings in a suitable fluid, and any cracks show up as dark lines.

When using a non-destructive form of test it is usually possible to establish the limits of a fracture and to know if it requires immediate attention or not. When a magnetic crack detector is used, only the end of the fracture in the rivet hole periphery can be seen. The procedure then is to calculate the maximum size of hole which will not disturb the seam efficiency too much, and reamer the hole to that figure. Frequently the fractures disappear and a new over-size rivet can be fitted.

Sometimes, however, the fractures do not disappear, thus suggesting that they may run on through the plate to the next rivet hole. The rivet in the last mentioned must be removed and the crack detector applied again. If a fracture or fractures show up in line with those previously found, then it is very probable that the plate is fractured from hole to hole. It is also probable that other similar fractures exist in other parts of the seam and, unless the drum is condemned out of hand, the entire seam must be searched by one of the non-destructive methods described above. If only one hole-to-hole fracture is discovered the full length of the seam is suspect, and no expense must be spared to prove its safety.

PROBLEMS AND PRACTICE in Engineering

Commutators and Slip Ring Turning

WITH reference to T. H. Snelson's recent note re above, I have found, after many years of experience, that, whenever possible, it is quicker and much more satisfactory to avoid the use of the shaft centres altogether.

By gripping the driving end of the shaft in the lathe chuck and supporting the commutator and bearing journal in a "steady," it only takes a few moments to adjust the shaft, until both journals are running true, the final adjustments being verified by a micrometer dial gauge.

In a case where the shaft runs on ball bearings, it is not usually necessary to remove the ball races from the shaft, as the commutator end outer race can be gripped lightly between the jaws of the "steady," leaving the shaft free to revolve in its own bearing.

If for any reason after the shaft has been set up, as above, it is found that the proximity of the "steady" interferes with the turning of the commutator, it is quite easy, with this "set up," to true up, or recut, the shaft centre at the commutator end. Having done this the "steady" can be removed, using instead the loose headstock in the now true shaft centre. —*T. H. H.*

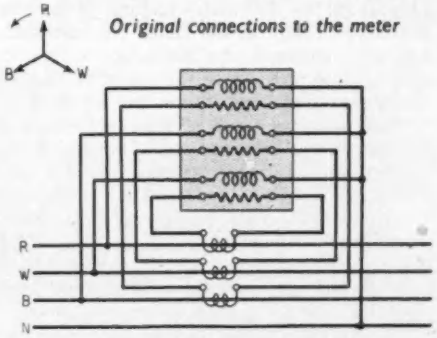
Negative Units

I HAD to attend to a metering complaint which merely stated: "Consumer complains of meter going backwards when power factor correction equipment installed."

On visiting the installation, which was in a medium-sized colliery, I observed that the meter was going forward and appeared to be in order. However, the electrical engineer assured me that when they had installed new power factor correction capacitors the meter had gone backwards, and for this reason they had left them switched out. At my request the capacitors were switched in and this caused the meter to rotate in the reverse direction at least as fast as it had been going forward previously.

Realising that something serious was wrong, I checked out the meter wiring—the meter being a 3-element, 3-phase, 4-wire, c.t.-operated type—and discovered that each current element instead of being associated with its own voltage was associated with a voltage lagging it by 120°.

On questioning the electrical engineer, I found that the working power factor of the colliery was in the region 0·6/0·7 lagging, and on constructing a vector diagram, as shown, it became obvious what had been happening.



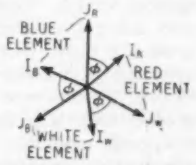
Original connections to the meter

For purposes of illustration the vector diagram is taken as a balanced load with a phase angle of 50° equivalent to a P.F. of 0·64 (lag), in which case it is seen that the meter is measuring:—

$$3VI \cos (120°\text{-}50°)$$
$$= 3VI \times 0{\cdot}34 \text{ watts}$$
$$= 1{\cdot}02VI \text{ watts.}$$

However, when the p.f. connection was switched in, lifting the p.f. to near unity, the meter measured:—

$$3VI \cos 120°$$
$$= -3VI \cos 60°$$
$$= -1{\cdot}5VI \text{ watts.}$$



Vector diagram of voltage load current. (J refers to voltage phase

which is seen to cause the rotation in the reverse direction at a speed slightly in excess of that obtained in the forward direction.

The matter was reported to head office who had the connections altered, and proof of the above diagnosis was obtained in so far as on the first complete meter reading after the connections were altered kW (md) and kWh were almost double the value they had been in any like period.—*J. Carr.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

I.E.E. Centre Addresses

deal with factory distribution, the country's future and telecomms development

ELECTRICAL engineering in the steel tube industry was the subject chosen by MR. H. E. KNIGHT, M.I.E.E., C.C. (Stewarts and Lloyds) for his chairman's address to the East Midlands Section of the I.E.E. He combined a general outline of tube production techniques with a close analysis of the methods of electricity supply and application that are involved.

Four principal types of drive are required. The first is for constant speed, for which a.c. motors can, of course, be used. Up to 1 h.p., single phase 230 V machines are employed; from 1 to 70 h.p., 415 V, 3-phase, while above 70 h.p. most motors are supplied at 3·3 kV. A few of the largest motors are operated at 11 kV.

Where speed changes are required only between "runs" change-pole s.c. motors or a.c. commutator motors are used wherever possible, but in most cases d.c. machines are necessary, lightly compounded and with shunt control for a 3 : 1 speed range. For truly variable-speed drives, Ward-Leonard sets are the rule, and they are generally large enough to warrant the use of 3·3 kV or 11 kV main driving motors. Grid controlled rectifiers are also being considered, and it is hoped that these will prove most suitable when problems concerning braking and regeneration have been solved. A final type of drive gives rapid and precise tube movement, and for this air or hydraulic cylinders controlled by solenoid-operated valves are used. Wherever possible, 110 V a.c. or d.c. supplies are taken to the solenoids, to eliminate some problems of using mains voltages in mill conditions.

Distribution

At the Corby tube works the incoming supply is at 33 kV, and this is transformed down to 11 kV by two 15 MVA transformers. An 11 kV ring main then supplies the four works substations, each of which has ring main equipment, usually with a bus-section breaker dividing the board into two sections. Each substation has an associated 3·3 kV system of radial feeders, and some 2 MVA of 415 V (3 wire) supplies. This system is also arranged radially, but there is some provision for emergency interconnection at the ends of feeders.

A basic design of a static type substation has been evolved, permitting easy extension with a growing load by extending the building as required longitudinally. The width of the building is fixed initially by the estimated ultimate length of the 11 kV board and its associated control room, and this forms one transverse compartment. The 415 V and 3·3 kV equipment and rectifiers then run parallel with one another and at right angles to the 11 kV apartment. Step-down transformers are housed in external bays on the sides of the building appropriate to their switchgear and rectifiers.

Unfortunately it is not possible to give a full summary of this section of Mr. Knight's address which went on to discuss circuit arrangements and motor types at some considerable length. He concluded with a summary of the main finance policy adopted which places emphasis on preventive maintenance. Weekly inspection is required of each and every electrical item on a mill. The same system applies as regards cable runs and h.t. and l.t. switchgear, although the interval of inspection here varies from three to six months. Tests on transformer oil are taken annually, with a filtering drying process every second year.

Great Britain's Future

In presenting his Chairman's Address to the North Eastern Centre, MR. H. LEYBURN, B.SC., M.I.E.E. surveyed the future prospects of this country. After pointing out that the results of two world wars had reduced our overseas investment, and that the industrial revolution had caused us to become largely dependent for food on overseas production, he considered the three possible courses open. The first of these was to produce manufactured goods of such quality and at such prices that they would continue to appeal to those countries from which we obtained our food and materials. The second was to increase home agricultural production to a point which would make Great Britain almost self-supporting, and the third, which might take a few generations and might even be impracticable was to reduce the level of the population by emigration to other parts of the Commonwealth.

The engineering industries had a large part to play in contributing to the solution of these

problems. According to the latest census of production returns, they had now displaced textiles, clothing and leather as the largest contribution to total production. In view, however, of the tendency toward industrialisation in many hitherto agricultural countries, the aim should be to make Britain the "workshop of advanced techniques." This could only be done by ensuring that we were right in the forefront of technological development. This in turn implied the development of research and the rapid and efficient conversion of research discovery into industrial production. It was in this latter field that Great Britain lagged behind America.

Training

It was generally agreed that British degrees in engineering were usually on a somewhat higher level than the corresponding American degrees. Thus the B.Sc. was only slightly below the American M.S. and the Higher National Certificate only slightly below the American B.S. However, while the number of American B.S. degrees conferred in 1950 was about 52,000 the number of H.N.C. and similar degrees in this country in the same year was only 5,000. Was it not reasonable to suppose that this disparity was an important contributory reason why some new ideas were not being put into practice as quickly as in the U.S.A. and in other industrial countries?

Above are seen a Ward-Leonard set and frequency changers in an air-conditioned substation at Corby. On the left is a three-section 415 V main switchboard

Telecommunication Developments

A description of some of the more recent applications of communication research in the South West of England provided the subject of the address by MR. A. C. WARREN, B.SC., M.I.E.E., to the Western Centre. In the "local" system, marked improvement had been made in the actual telephone instrument. With the availability of new magnetic materials and the application of recent research, a new, more efficient telephone was being manufactured which would gradually replace existing instruments. This would not only benefit the subscriber, but would also enable further economies in line plant to be obtained.

Developments of particular interest had been taking place in the Bournemouth, Southampton and Bristol multi-office areas. At Bournemouth, a relief manual exchange in standard hutting had been erected, and a transference to automatic working was taking place. At Southampton a change-over from the existing non-standard system to the standard was under way, while at Bristol an alteration was being made in the numbering to provide greater capacity for future working. A non-director trunk exchange was also being planned for Bristol, and it was anticipated that this would be completed some time in 1956.

The Chairman then explained the method of operation of carrier telephony over coaxial cables with particular reference to the circuits carrying television signals and also the England-Channel Islands link. Special emphasis was placed on the submerged repeaters included in these links. The paper concluded by giving an account of the micro-wave radio links at present being used to transmit the television programme to Wenvoe pending the completion of the cable link.

METAL RECTIFIER DEVELOPMENTS

IT is announced by the National Bureau of Standards, America, that promising results have been obtained from investigations on titanium oxide as a semi-conductor in metal rectifiers. The work is being carried out by Messrs. R. G. Breckenridge and W. R. Hosler in the N.B.S. Solid State Physics Laboratory.

The rectifiers are prepared by forming a layer of titanium dioxide on a sheet of titanium metal, and then applying a counter-electrode to the oxide surface. Two processes have been devised to form the oxide layer. The first involves the heating of the base metal first in oxygen and then in hydrogen, while the second consists of heating the metal in steam at high temperatures. The latter process is considered the better as the two-step process is difficult to control. The most satisfactory films are formed by heating polished titanium plates, $\frac{1}{2}$ in. square and 0·020 in. thick in steam at 600° C for about three hours. The counter-electrode is then electroplated on the desired rectifying surface of the oxide by a.c. plating techniques. A number of metals, including silver, gold, tin, nickel, copper, zinc and cadmium have been used for this purpose satisfactorily, although silver has been used for most of the work.

The units can withstand a reverse voltage of about 20 volts/plate, and have good properties at elevated temperatures. In fact their performance is actually improved with increased operating temperatures up to 150° C.

Although they bear a physical resemblance to the copper oxide type, their actual method of operation is different. For example, the easy flow of current is opposite in the two types. In the titanium dioxide rectifier, electrons flow from the titanium metal base plate to the counter-electrode. The mechanism of conduction is also different. In cuprous oxide, the charge carriers are "holes" or electron vacancies in the lattice, while in titanium dioxide semi-conductors the charge carriers are free electrons. Finally the "barrier layer" or asymmetrical potential that must be surmounted by the charge carriers is apparently located near the counter-electrode/oxide interface for the N.B.S. type, while there is evidence that in the cuprous oxide device the barrier is at the base metal/oxide surface.

Londonderry Extensions

THE Electricity Department of the City and County Borough of Londonderry has a long and honourable history going back to 1891 when the Corporation was first authorised to supply electricity within the Borough. The first plant installed was by Messrs. Siemens and consisted of two Lancashire type boilers, operating at 110 lb/sq. in. steam pressure and driving three marine type compound condensing engines from which six 30 kW 3,000 volt d.c. generators were driven. By 1940 the plant had expanded to 10 MW capacity.

In 1941 to deal with increasing demand the question of plant extension was again considered, and a scheme costing £79,000 was proposed. A suggestion was, however, made that it would be more economical to take bulk supplies from Belfast, and a lengthy controversy ensued. However, by March 1949, the local plant extension was approved, and the original 1941 scheme adopted, now, however, at a cost of £135,000 and to meet further increased costs an additional loan of £25,000 was raised in February 1950. This extension was formally inaugurated on Friday when the Mayor and Corporation, representatives of the Government, the Northern Ireland J.E.C. and the Northern Ireland E.B. were present.

It should be noted that Londonderry is the only remaining independently operated undertaking of the kind now remaining in the U.K.

Power Plant

The latest extension comprises a 6 MW, 3·3 kV, impulse type turbo-alternator made by Metropolitan Vickers Electrical Co., operating under steam conditions of 220 lb/sq. in. at 750° F. The boiler plant comprises the normal water tube Yarrow type of boiler with an m.c.r. of 50 klb/hr with International Combustion stoker, Greens economiser, Davidson fans and Bailey metering. With this extension, the "modern" part of the powerstation now has two 6 MW sets and two 50 klb/hr boilers which are to take over base load duties.

It is hoped to avoid having to increase charges to Londonderry consumers for some time, as, due to full utilisation of existing facilities, the plant was installed at a price of about £25 per kW.

At a luncheon in the Guildhall Lord Glentoran, H.M.L., M.P., said that Mr. Macrory—who has been City Electrical Engineer since 1898—was the man of the moment.

T. C. GILBERT, M.I.E.E., *discusses*

Safeguards for Installations

PERIODICAL INSPECTION, RELIABLE EARTHING OR SUITABLE INSULATION

THE most recent report concerning accidents by shock and fire in domestic premises, and editorial comment thereon, lay considerable emphasis upon the necessity for periodical inspection of installations, particularly the earthing systems, a matter that has occupied the minds and disturbed the sleep of electrical engineers for many years. To some extent, although a very limited one, periodical inspection is at present practised, but usually in connection with buildings where the presumably general excellence of the original installation makes it the least necessary.

For instance, a well-known fire surveyor* has stated in his book, "Although it is impossible for tests to reveal every incipient defect to which an installation is or may in the future be subject, there can be no question whatever that the number of electrical fires would be greatly reduced if periodical tests were more the rule. Thus, in the evidence given before the Royal Commission on Fire Prevention and Fire Brigades, it was said that normally all electrical installations in public buildings coming within the jurisdiction of H.M. Office of Works, were tested every three months, and in the case of buildings of public resort the London County Council require in addition to other routine tests that a 'certificate by a qualified electrical engineer to the effect that the electrical installations have been examined and tested and are in a safe working condition shall be submitted to the Council once every fourteen months'."

Safe Life of Installations

The matter of deterioration of electrical installations by reason of age presents considerable difficulty, as it is impossible to determine their useful or safe life. Some jobs made with wood casing 50 years ago appear perfect under normal tests, whilst others in metal enclosures of considerably less antiquity exhibit defects, especially of the kind to which attention has been called, demanding immediate attention. Again quoting the authority mentioned above, "General expert opinion seems to incline to the span of twenty to thirty years as the safe limit—certainly leaving a wide enough margin for error and admitting, of course, that the conditions under which the cable has spent its life have a most important bearing on the matter." In 1944 a memorandum was prepared by a sub-committee of the Post-War Planning Committee of the Institution of Electrical Engineers which expressed the opinion, "Of the nine million domestic installations in this country probably some eight and a half millions, or 95%, are new, i.e., were installed not earlier than 1919 and mainly since 1929; the average age of installations as a whole must steadily increase. Despite this increase of average age there is no doubt that the better materials and workmanship which will be employed in new installations will substantially check the incidence of accidents due to deterioration." It will be noted that the report refers only to domestic installations, but the question is—if an installation can be considered as "new" when it is 25 years old, when in all conscience does it become "old"?

Insurance Problems

Is there a disposition to blink the fact that the average house is built to last three or four times as long as the likely safe life of the electrical installation? Again quoting the fire surveyor previously mentioned, "It is surprising that the insurance companies have not long since laid down a maximum life for electric wiring, after the expiry of which premiums would either be increased on a sliding scale with each additional year or the risk would be declined. Has not the time arrived for the collection of evidence as to the safe life of such wiring with a view to action being taken to ensure replacement after a specified period, either by legal compulsion or by means of pressure on the part of the insurance companies?" He is, however, merely quoting another authority—one of the leading electrical journals!

Nobody has yet suggested how these inspections and assessments of age—not as simple a matter as would appear in the absence of

* "*Electricity and Fire Risk*," *E. S. Hodges*, F.C.I.I., A.M.I.E.E.

records—are to be carried out, nor who is to bear the expense. Assuming that there are now 10 million domestic installations in this country, an army of 5,000 inspectors would require nearly six years to do the work, optimistically assuming that one inspection per day would be the average. This is obviously far too long a period between checks, but one per year, still not sufficient, could only be made by increasing the army to 30,000, plus the necessary administrative and recording staffs. Even so, the matter which has mainly concerned the factory inspectorate, the checking of earthing arrangements, would hardly be achieved, as any one of these might fail as the inspector left the premises. Would the inspectors be empowered to enforce the consumer to make good any defects, or merely advise to this end?

It must be agreed, it is thought, that the matter of adequate check of domestic installations is an utter impossibility, and that we have, instead, to devise protective systems that are either themselves automatically indicative of failure or are amenable to simple check and test by the consumer himself. These methods may be slightly more costly than direct earthing, but the latter has now been shown to be utterly unreliable without check and test, which, on the other hand, is far too costly and complicated. The point of "adequate" test and check has been emphasised, as most likely the inspectorate would demand "loop" tests for the earth circuit, and also presumably heavy current tests, as so often advocated in factory department reports and in the Electrical Research Association Report V/T109, "The Incidence and Avoidance of High Resistance Joints in Steel Conduit Runs in Service."

Revised Ideas on Insulation

Failure of insulation is, of course, the major source of danger in old installations, as in new ones, and it is just this portion of the wiring that deteriorates progressively; also, in the writer's own experience, this failure has most often been encountered and brought to light in installations with V.I.R. cables and metal conduits, but not always, unfortunately, with safe and effective fuse clearance. If, however, safe direct earthing can only be ensured if accompanied with continuous inspection and test of impossibly high cost and extent, then surely it is time to revise our ideas as to what comprises safe wiring. A remarkable step forward in this direction has been made in the twelfth edition of the I.E.E. regulations, with exemption from the general requirement for earthing for metal-enclosed appliances equipped with reinforced or double insulation, and the same forward-looking view should be applied to wiring installations. The comparative excellence of fifty-year-old casing and capping installations with others made more recently may provide a pointer to future practice.

This is, of course, to revive the old controversy of the 1930's—insulation versus earthing—with the following important differences. In those days we had little to offer in substitution for metal, but we now have a wealth of synthetic and plastic materials which, in conjunction with double insulation, make metallic enclosures either safe or superfluous. Also, with the increased loading of domestic installations today we are finding that earthing via metallic enclosures is nothing like as reliable as we had been persuaded, but must be backed up with constant checks. Nor should the increasing tendency of water supply authorities to use cement-asbestos underground piping be overlooked in our contemplation of safe installations for the future, as this may rob us of the one really good electrode available previously.

Non-metallic enclosures for wiring and double insulation for our metal-clad appliances might enable us to get rid of this earthing bugbear for good and all, and render unnecessary expensive inspections, apparently to become essential if our present methods are prolonged.

RESEARCH INTO GERMANIUM

CONTINUED progress in the study of germanium is recorded in "Radio Research 1951", the report of the Radio Research Board, D.S.I.R. Moreover, some satisfaction may be gained from the knowledge that this metal is now being produced on a commercial basis in this country.

Research has been mainly directed towards the reverse current flow characteristics of germanium and radio noise produced when this reverse current is flowing. The effects of electrical forming, a manufacturing process in which final modifications to the characteristics are effected electrically, have been subjected to detailed study. It is found that forming by d.c. effects a reduction in the maximum (or turnover), voltage appearing in the reverse current-voltage characteristic.

This reduction is of considerable value if the germanium transistor is used as an oscillator. With the turnover voltage reduced to 10 V, sustained oscillations of 0·5 mc/s can be produced at input powers of only a few tens of milliwatts. "Radio Research 1951", H.M.S.O., 1s. 6d.

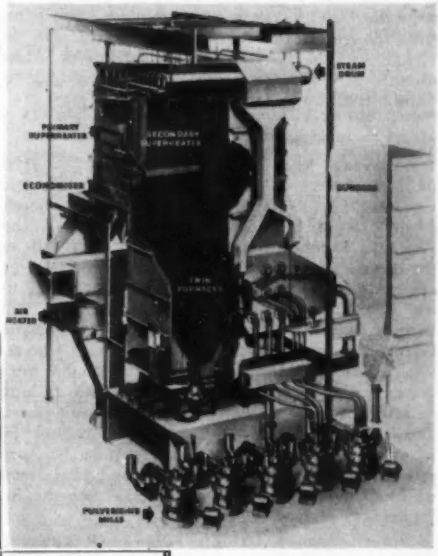
CASTLE DONINGTON BOILERS

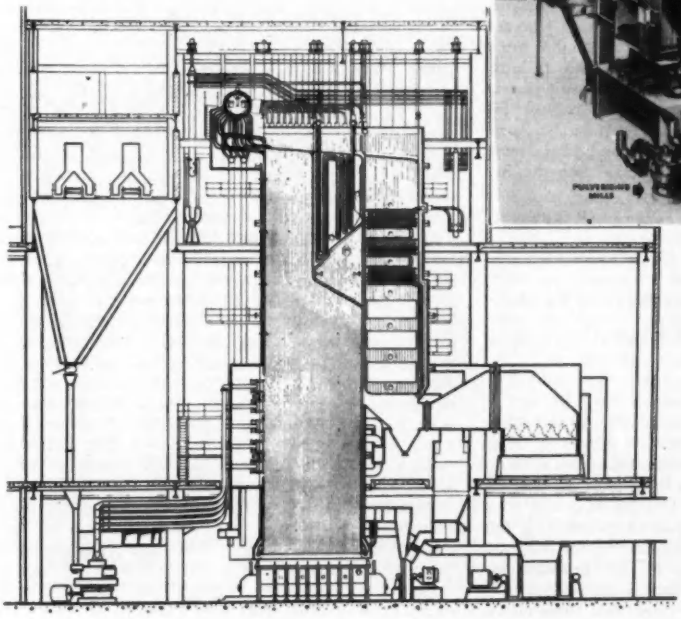
New units to steam 830 klb/hr., 1,600 lb/sq in. at 1,060° F.

THE new boilers for Castle Donington power station of the B.E.A. East Midlands Division are designed for an output of 830 klb/hr—50% greater than that of any boiler so far built in Britain—with steam conditions of 1,600 lb/sq in. at 1,060° F.

These unit boilers are of the twin furnace design and have twenty burners per boiler arranged in five tiers of four burners. Each tier is fed by a Babcock "E" mill with a capacity of 15 tons per hour. Coarse control of steam temperature control is obtained by utilising combinations of various tiers of burners, while fine control within close limits is maintained by spray type attemperators, located between primary and secondary superheater stages. The primary superheater is of the horizontal loop type, while the secondary superheater is of the pendant type, located behind a slag screen near the top of the combustion chamber. An economiser of the continuous loop tubular pattern is incorporated, and the drum is fitted with steam separator units of the Babcock "Cyclone" type.

There is, also, a small recuperative air heater of cast-iron construction for the primary air, through which gases from a hot zone of the furnace can be by-passed as necessary. For very wet coal, the primary air temperature can, by this means, be boosted up as required to maintain the desired temperature (around 160° F) of the coal and air mixture passing through the mills.





The layout and arrangement of the boiler can be seen from these pictures. Leading dimensions are 120 ft from ash basement to drum level (144 ft overall), 85 ft wide and 75 ft between front and rear stanchions. Overall depth including auxiliaries is 152 ft. It is understood from Babcock and Wilcox that the first of these units is due to steam in 1955

overseas news

Commission Approves Seaway

Approval of the International Joint Commission was given last week to the St. Lawrence Seaway and Power project. That commission operates primarily to control the level of the boundary waters and although Canada is all set to get ahead two further steps must be taken by the United States before the joint development of the power side of the project is finally cleared. Firstly, an American authority has to be chosen to develop power on the U.S. side of the International Rapids, and secondly, that concern must obtain permission from the American Federal Power Board. On the Canadian side, the Hydro Electric Power Commission of Ontario has already been nominated to handle the power project.

Quebec Project

Early next year work is to start on the $100 million project of the Quebec Hydro Electric Commission to serve expanding industrial needs of the Eastern Quebec region, Mr. Duplessis, the Province Premier, stated recently. This will be the largest single hydro-electric development ever undertaken in the Quebec province, according to the Hydraulic Resources Department. It will include construction of a large power plant on the Great Bersimis River, 85 miles north of Forestville, with generating capacity of 1,000,000 h.p., construction of a dam 200 ft high, 2,500 ft long at Lac Casse, 15 miles north of the power plant, and creating a reservoir covering an area of 260 sq miles. The scheme also involves the construction of an 8-mile tunnel and the laying down of four 31-mile submarine cables across the St. Lawrence.

Money Needed

The Wallaceburg Hydro-Electric Commission, Ontario, is asking the town council to raise $200,000 by the issue of debenture stock for necessary plant expenditures, part of which are connected with the frequency standardisation now in progress in the town.

Stop Selling Appliances!

Winnipeg City Hydro electricity undertaking has been asked to close down its retail electrical appliance business. The demand has been made by a delegation representing the Retail Merchants Association, who, while admitting that the City Hydro has done a good job in pioneering the appliance trade in Winnipeg, emphasise that the original reason for setting up the business no longer exists. A brief presented by the Association maintains that the retail trade can more than supply the needs of consumers in instalment buying, repairing and servicing, and alleges that the City Hydro lost $54,000 in 1951 in operating its appliance business and will probably lose more this year. The brief also accuses City Hydro and the Winnipeg Electric Co. of selling stoves and refrigerators at wholesale rates for new apartment blocks to get power contracts.

Milan's Tube

The first line of a new underground railway for Milan could operate in two or three years' time, given adequate finance, it has been stated. Signor Agostino Belloni, the engineer responsible, has estimated the total cost of the 13 kilometre-long first line at 20,000 million lire. But it still remains for the Milan city council to express its opinion and eventually to approve the draft project, which has already undergone some slight modification.

West German Needs

West German power plants need investments of 1,500 million D-marks annually to enable them to meet the area's requirements for electricity and gas, the Economic Ministry, at Bonn, has stated. Two-thirds of that sum would be for electric power plants and one third for gasworks, the Ministry said.

Cape Province Expansion

The electricity undertaking of the East London City Council sold over 76 million units—an increase of more than 7 million—it was stated at the recent meeting of the council. Revenue reached the record figure of £365,240, which was £33,892 above the previous year's figure, while the average price received per unit sold increased from 1.142d. to 1.143d. Consumers now number 11,474, an increase of 448. The council is solely concerned with distribution, its generating station having been taken over by the Electricity Supply Commission of South Africa in 1941. Many major extensions of the distribution system were carried out during the year; nine new substations were equipped and put into commission, and 43 substations were changed over from 6.6 kV to 11 kV operation. Large extensions of the distribution system, including the provision of a number of substations, are in hand and are expected to be completed at an early date. Work has also commenced on the new power station for the Electricity Supply Commission which is designed to have an ultimate capacity of 90,000 kW. It is hoped that the first portion, of 30,000 kW capacity, will be in service by 1954-55.

Diesels for Rhodesia

An order for 23 main line diesel electric locomotives has been placed by Rhodesia Railways with the English Electric Co. Ltd. They are to operate on the 3 ft. 6 in. gauge main line between Salisbury and Umtali, a section some 170 miles in length which includes severe curves and gradients as steep as 1 in 40, over which a single loco unit will haul trains weighing up to 850 tons. The locomotives, to be built at the Preston Works of the company, will have the 1 Co-Co 1 wheel arrangement and will weigh 113 tons. Each loco is to be powered by an English Electric 16-cylinder V type supercharged diesel engine normally rated at 2,000 b.h.p. at 850 r.p.m. but derated for site conditions to 1,710 b.h.p. at 850 r.p.m. Starting tractive effort (a 30% adhesion) will be 60,000 lbs. and the continuous tractive effort, 36,000 lbs. at 13.5 m.p.h.

Authority for Cyprus

Under provisions of a Bill recently gazetted and expected to become law any day now, the Electricity Authority of Cyprus is to be set up. The new authority will be responsible for the generation and distribution of electricity throughout the island, with powers to acquire existing supply undertakings at dates yet to be determined. It will also promote and encourage the use of electricity, especially for agriculture, industrial and manufacturing purposes. The authority, which is to consist of four persons, including a chairman, will have powers to make regulations covering electrical installations in various premises. Publication of this Bill comes on the eve of the completion of the first stage of the Cyprus Electrification Scheme on which work started nearly three years ago. At present the supply of electricity on the island is confined to a few municipalities and to installations owned and operated by several mining undertakings. But it should not now be long before the first stage of the new 70 MW steam power station under construction at Dekhelia is operating in conjunction with the new 66 kV and 11 kV grid system.

Damodar Investigation

Accepting recommendations, the Government of India has set up a special committee to examine and report on the various points at issue relating to the execution of the Damodar Valley project. The committee is also to make recommendations with a view to achieving the most economical and expeditious development of the scheme.

Looking Forward

The State Government hopes atomic power will be available to meet future demands in South Australia after the completion of the second Leigh Creek coal-burning powerhouse at Port Augusta. This was announced in Parliament last month by the Premier, Mr. Playford, when presenting the 1952-3 Budget. He said the development of uranium was the greatest venture the State was undertaking in the interests of industrial growth. The arrangements for the development and use of the State's uranium resources included as pivotal points two factors—the building up of physical stocks for local use in power production, and the acquisition of scientific and technical knowledge of atomic power production, he went on. Arrangements were being made for exchange of officers and information on the subject, with the most important research activities in both the U.K. and America. If they could gain early success in this project they would make good what was the State's most serious shortage—local fuel for industrial power, he added.

Tasmania's Loss

For the first time in 25 years, the Hydro-Electric Commission of Tasmania in its year to June 30 last, has made a loss it is revealed in the annual report just tabled in the House of Assembly. The loss for the year amounted to £88,505. The sale of bulk power to consumers brought in £372,000 and supply of current to retail consumers added more than £1,420,000 to the commission's income. Revenue from the sale of bulk power increased in 1951-52 by £37,000, but power restrictions and long-term contracts at fixed prices limited the gain in revenue from that source. Capital expenditure during the year amounted to £8,605,000, of which the hydro project at Bronte accounted for over £2,100,000, while the expenditure on the Trevallyn power development scheme was above £1,300,000.

Brisbane Co's Franchise

Renewal of the franchise of the City Electric Light Co. Ltd., of Brisbane, which expires on February 1, 1954, was discussed at a conference last week called by the State Premier, Mr. Gair. The conference was attended by State Government officials and representatives of the company. Under its present franchise, the company supplies electricity to more than 10,000 square miles of South East Queensland. According to reports it seems likely that the Government will soon decide on terms for renewing the franchise. But in some quarters it is suggested that the Government may place limits on the company's subsidiary undertakings.

Small Stations in Queensland

The seventh Western Queensland rural power house built within the past year was officially opened a few days ago by the Minister for Mines, Mr. Riordon. It was expected that a further three stations will be completed before the end of this year. The station just opened is at Julia Creek, the three to come will be at Alpha, Muttaburra and Jericho. The State Electricity Commissioner Mr. H. N. Smith, said the 10 stations each cost about £25,000 and supplied an average of 150-200 consumers. They could be operated by one man. The six stations already working are at Quilpie, Isisford, Taroom, Richmond, Tara, and Aramac.

PERSONALITIES

IN THE INDUSTRY

The directors of Siemens Brothers and Co., Ltd., announce that **Mr. H. E. Humphries,** who is already a director, has been appointed managing director of the company in succession to **Mr. F. A. Lawson,** who has left the company's service and vacated his seat on the board.

Mr. H. E. Humphries

With the Physics Department at King's College, Newcastle-upon-Tyne, for the past four years under an I.C.I. Fellowship, **Dr. J. S. W. Bell,** B.SC., PH.D., has been appointed assistant professor in the Physics and Electrical Engineering Department at the Royal Naval College, Greenwich.

Mr. Geoffrey Cole has joined the Publicity Department of Thorn Electrical Industries Ltd., as chief assistant to Mr. S. T. Holmes, the publicity manager. Mr. Cole was previously an executive with Alfred Pemberton Ltd., and was for some years with S. H. Benson Ltd.

Mr. A. E. Lanigan, A.M.I.E.E., has now taken up his new duties as district engineer at Jarrow-on-Tyne in the Wear sub-area of the North Eastern Electricity Board. Mr. Lanigan who succeeds the late Mr. J. M. Nicholson, was previously first assistant district engineer of the South Shields undertaking of the Board.

Among the new appointments to the Economic Planning Board, announced on Tuesday, is that of **Sir John Maud,** permanent secretary to the Ministry of Fuel and Power.

To mark the silver jubilee of the Dublin electrical firm of Kelly and Shiel, Ltd., presentations of silver utensils were recently made to each of the three directors, **Messrs. J. K. Maconchy** (chairman), **A. O'D. Shiel** (managing director) and **G. T. Kelly,** by **Mr. J. W. Gorman,** the general manager, on behalf of the staff. Mr. Maconchy said the firm started 25 years ago with three men and an office boy. The three men were now its directors, and the then office boy was Mr. Gorman.

The directors of Siemens Brothers & Co., Ltd., announce that **Sir Hugh Warren,** D.SC., M.I.E.E. M.I.Mech.E., and **Mr. Ronald L. Basset** have been appointed additional directors of the company.

Following the death of Mr. H. W. Cain, material controller to George Kent, Ltd., some reorganisation of the Production Control and Material Control Departments has been introduced, we hear. **Mr. J. F. Willsher,** formerly production controller, has now been appointed production manager, responsible for both material and production control.

Mr. J. F. Willsher

Mr. M. W. Humphrey Davies, B.SC., M.SC., M.I.E.E., has been appointed to the University Readership in Electrical Engineering tenable at the Imperial College of Science and Technology, South Kensington.

About 1,100 members attended the annual social gathering of the Long Service Association of Metropolitan-Vickers Electrical Co., Ltd., held in one of the staff canteens at the Trafford Park Works. The president, **Sir George E. Bailey,** C.B.E., who is also chairman of the company, is himself in his 45th year of service, having joined in December, 1907; seven of his colleagues on the board are members of the L.S.A., among them **Dr. I. R. Cox,** D.S.O. (managing director) and **Sir Arthur P. M. Fleming,** C.B.E., who holds the record for length of service, having joined in May, 1900. The latter was unable to be present owing to indisposition. After his presidential address, in which he spoke of the value of the Association and its beneficial influence in the company, Sir George Bailey made presentations to nine members who had completed 50 years' service during recent months.

Sir George Bailey, right, presents a gift

Mr. S. G. Wood

Mr. S. G. Wood, A.M.I.E.E., has been appointed engineer of the Coventry Sub-Area of the East Midlands Electricity Board. He joined the Coventry Corporation Electricity Department in 1930 and served in the Installation, Technical and substation Departments before becoming assistant mains superintendent in 1949. Since 1950 he has been assistant sub-area engineer at Coventry.

Mr. S. B. W. Williams, B.SC., A.M.INST.C.E., has joined Mr. G. R. Allen, M.C., A.M.INST.C.E., as a partner in the firm of Peirce and Williams, chartered civil engineers, and that concern has has now been re-styled as Allen and Williams. Mr. Williams is a son of a former partner of Peirce and Williams. After serving articles with and subsequently as assistant to Binnie, Deacon and Gourley, Mr. S. B. W. Williams joined the water engineer's staff in Singapore and became deputy water engineer there.

Halifax Corporation Highways Committee has promoted **Mr. Andrew Hardie,** chief inspector of the Public Lighting Department, to the post of lighting superintendent.

Our accompanying photograph was taken at the presentation dinner given to **Mr. A. E. Aird** of No. 1 sub-area of the Merseyside and North Wales Electricity Board, to whose retirement we referred last week. The presentation was made by Mr. P. Bregazzi, sub-area manager. Mr. Aird started with the Liverpool Corporation Electric Supply Dept. as an apprentice in 1902. In 1919 he became installation superintendent and held successive posts until, as superintendent of works and substations, he was responsible for all substation and outside installation work.

Mr. Aird, left, receives good wishes from Mr. Bregazzi

Mr. A. Gilbert, A.M.I.E.E., engineer (meter) in charge of the London Electricity Board polyphase meter test station at Bromley has been appointed meter superintendent to the Singapore Corporation and leaves England to take up his new post on November 14. Before vesting date he was employed by the Beckenham Corporation and was previously with the Admiralty Compass Division, the Northampton Electric Supply and Chamberlain and Hookham, Ltd. He was a popular member of the staff and to mark their appreciation, **Mr. L. A. Gripper,** sub-area engineer, presented him on their behalf with an inscribed brief case and cigarette lighter.

OBITUARY

Mr. Kenneth S. Geipel, O.B.E., M.I.E.E., chairman of William Geipel Ltd., died on November 1, aged 61, after a long illness. He joined his father's firm, William Geipel and Company on leaving Tonbridge School, and after serving in the R.E. (Signals) in the 1914-18 war, when he was awarded the O.B.E., returned to the firm, becoming a director on the formation of William Geipel Ltd., in 1927, and chairman on the death of his father in 1937.

Mr. W. R. Elliott, A.M.I.E.E., who died on October 16, aged 74, was for nineteen years engineer and manager of the East Ham Corporation Electricity, from which position he retired in September, 1943. Subsequently he was, for a time, secretary of the British Electrical and Allied Industries Research Association. Altogether he served the East Ham Electricity Department for forty-two years, and under his administration the undertaking made remarkable progress. Prior to going to East Ham, he had gained experience with Marconi's Wireless Telegraph Co., and the National Telephone Co. Mr. W. R. Elliott was the father of Mr. Norman Elliott, chairman of the South Eastern Electricity Board, to whom we offer our sincere condolences.

Mr. Frank Malby, proprietor of the Clacton-on-Sea electrical contracting business of that name, died recently.

Mr. J. F. Driver, M.I.Mech.E., M.I.E.E., D.L.C., who was head of the Department of Electrical Engineering at Loughborough College for many years, retiring in 1943, died on October 28, aged 70. Since retiring from college work he spent a good deal of his time in London as editor of *Machinery Lloyd.*

Lt.-Col. J. Price Walters, T.D., B.SC., A.M.C.T., F.INST.F., chief fuel engineer to the Ministry of Fuel and Power, died on November 3, aged 50.

Mr. Frank Croft, who was chairman and joint managing director of Crofts (Engineers) Ltd., from 1920 till retiring for health reasons in 1936, died on October 28, aged 74.

Mr. W. P. Conly, M.SC., M.I.E.E., branch commercial superintendent at Ringwood to the Southern Electricity Board, died recently, aged 54. Prior to going to Ringwood in 1950 he served the Southampton undertaking for many years.

NEW LITERATURE

Electrical Measurements

by F. K. Harris, Ph.D.

ANY conscientious work on so wide a field as this will assume proportionate dimensions and in this book no effort has been spared. Yet its scope is limited to direct current and power frequency measurements. What, however, has been thus lost is made up for in thoroughness of presentation. Each instrument dealt with receives due treatment, its merits, probable errors and possible applications are each discussed carefully and precisely. Despite the fact that the book is intended for engineering students one is left with the impression that its final circle of readers will be much wider.

By way of introduction, the subject of units is discussed at some length before the author launches out into his main theme. This at first tends towards direct current instruments, commencing with a detailed consideration of galvanometers before directing attention to other types of measuring devices. Ballistic galvanometers and magnetic testing generally are also fully covered to finalise d.c. considerations. Under the generic heading of a.c. measurements, power, energy and their measurement each receive careful study, leading to a discussion on waveform and frequency. Finally a comprehensive appraisal of a.c. bridges brings the book to a close. Published by Chapman and Hall, 784 pages, 9 in. by 6 in. Price 84s.

Electricity Undertakings of the World, 1952-53

SEVERAL changes have been incorporated in this edition, chiefly aimed at presenting the information in a more readily accessible manner. For instance, guide cards now project from the major sections. There has, of course, been a complete revision of the matter included, and an expansion in certain features, particularly in the place names indexed. As before, the volume is sectionalised into B.E.A., Area Boards, British Commonwealth and foreign undertakings, particulars of plant installed, and voltages of supply being given. The area board data follows the normal style, although the figures are for 1950-51, but this time, in view of frequent amendments, it has been deemed wiser to omit details of tariffs. The foreign section, too, does not include the many undertakings under the influence of the U.S.S.R., but these small points apart, the volume will again prove of considerable value as a reference book. Published by Benn Brothers, Ltd., 600 pages, 8½ in. by 5¾ in. Price 30s

Vacuum Technique

by A. L. Reimann, Ph.D., D.SC.

VACUUM techniques are playing an ever increasing part in modern life, affecting as they do such dissimilar items as electric light bulbs, bloomed lenses, deep impregnation and even dehydration of foodstuffs. Dr. Reimann in this book deals primarily with the problem of producing high vacua, and the physical and chemical processes involved. It is to the laboratory staff that most of his work is directed, although the heavier industrial side of vacuum pumping is not neglected.

Beginning with a brief introductory survey, Dr. Reimann then proceeds to a discussion on the speeds of pumps and conductance of pump lines, followed by a description of the types of pump available, pump systems and pumping procedure, glass manipulation, sealing, and absorption methods. Finally, there is a discussion on the various kinds of gauges available for vacuum work.

Although at first sight such a book might appear to be dull, it is in fact a fascinating work, mainly because of the individual craftsmanship and ingenuity which has been and is still being displayed in this field. For that reason alone it is worthy of a much wider readership than those comparatively few workers with high vacuum, to whom it will prove a valuable asset. Published by Chapman and Hall Ltd., 449 pages, 8¾ in. by 5½ in. Price 50s.

BOOKS RECEIVED

Putting it Back! by E. L. Eastell. Notes on battery charging presented in an informal yet informative manner. In it are discussed charging, upkeep and general care of both lead-acid and nickel-alkaline accumulators. Published by EASCO Electrical, Ltd., Brighton Terrace, S.W.9, 14 pages, size 8 in. by 5 in. Price 1s.

Data and Circuits of Radio Receivers and Amplifying Valves, edited by N. S. Markus and J. Otte. Supplement No. 2 in this series covering Philips valves introduced during 1945-50. Published by Cleaver-Hume Press for Philips Technical Library, 487 pages, 9 in. by 6 in. Price 40s.

Subject and Author Index of Papers in the Proceedings, 1937-51. Published by the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London S.W.1, 108 pages, 8½ in. by 5½ in.

Preparation of Standard Sand as used in B.S. method of determining the agglutinating value of Coal—Fuel Research Paper 56. Published by H.M.S.O., 8 pages, 9½ in. by 6 in. Price 1s.

Electrical Contractor's Annual, 1952-53, edited by J. Rosslyn-Stuart. Technical notes and trade guide. Published by E. and F. N. Spon, 288 pages, 8½ in. by 5½ in. Price 12s 6d.

Half-sized Heat-Entropy Chart for Steam, by H. Wright Baker. The "half-size" refers to the B.E.A.M.A. chart. Published by Edward Arnold, 17 in. by 17 in. Price 3s. 6d.

Sub-station Practice, by T. H. Carr. Comprehensive discussion of construction, equipment and operation. Published by Chapman and Hall, 467 pages, 8½ in. by 5½ in. Second edition. Price 55s.

RESEARCH ON CONTACTS

E.R.A. Reports on Research into Current Breaking Effects and Bond Strength of Galvanised Steel

AN interesting account of work on the transfer of metal between platinum contacts is contained in one of several E.R.A. reports recently published. Although the work is not complete, there is some indication of new ideas on the theory of this transference.

The report (Ref. U/T 125) shows that for the tests platinum contacts were used in the form of wire mounted on rubber bushes, made and broken by a cam mechanism. Contact was made with the wires crossing each other at right angles, so that the area of contact was a circle of radius approximately 0·03 mm. An inductive circuit supplied the contacts, with provision for varying the inductance.

Two Types of Transfer Apparent

Results show that, breaking a current of 1·3 A, metal is transferred from the anode to the cathode contact in two ways, depending on the inductance of the circuit. Below a limiting value of inductance (approximately 0·3μH) transfer of metal takes place independently of inductance, and its nature would suggest that "bridging" between the contacts is responsible. Above that value a second transfer occurs, superimposed on the first, varying with the inductance of the circuit. The explanation for this type of transfer is that arcing takes place as the inductance exceeds the critical value and metal is carried over by the arc.

Previous experiments in this field have established that a definite bridge does exist between metal contacts carrying current. As the contacts are separated, the bridges become molten and finally explodes. If this explosion is not symmetrical, more metal will be deposited on one surface than on the other, i.e. a transfer of metal has been made without arcing.

Galvanised Steel in Concrete

It is apparent that many manufacturers have been suspicious of the bond strength between steel angle that has been galvanised and concrete, when designing o.h. line towers. Whether these suspicions have any basis in fact is the concern of a report (Ref. O/T 7) in which are given test results on the bond strength of steel in concrete. To provide a comprehensive picture, tests were made in which factors taken into account were the shape of section (i.e. round or angle), and the nature of the metal surface (i.e. rough or smooth; plain or galvanised). From five batches tested, results indicate that earlier suspicions were in no way justified. Nowhere was the bond strength of galvanised steel less than two-thirds that of the corresponding plain steel.

Other Reports

Factors influencing the creep resistance of carbon steels is the subject of a report (Ref. J/T 151) by the E.R.A. J/E Committee on Steels for high temperature work, based on experiments conducted over nearly 20 years. It is extensive in character, and the results indicate that many and varied are the factors which influenced this property. It is interesting to note that aluminium in the steel has an adverse effect on the creep rate, and that in certain cases inspection of the grain size of the steel will give a good indication of the magnitude of its creep rate.

In a report (Ref. L/T 251) another step forward in dielectric research is made. In these experiments, the relation of dipolar permitivity and structure in ketone-paraffin mixtures has been studied, showing that a large change in the dielectric properties of these mixtures can result from a small change in structure.

Further work on the momentum theory of the wind turbine is detailed in a report (Ref. C/T 105) in which the theory is extended to remove a previous contradiction between theory and practice. This contradiction lay in the fact that earlier theory did not permit an interference factor greater than 0·5, whereas in fact it could approach unity. It is stated, however, that discrepancies still exist between observed and predicted values of thrust coefficient and further advance in this field will probably depend upon experiment.

An abridged version of a thesis for a Doctorate of Philosophy is given in a report (Ref. L/T 278) on the electrochemistry of non-aqueous solutions. It discusses the anomalous behaviour of certain weakly-conducting organic solutions when subjected to a potential over a period of time.

AMERICAN TECHNIQUES

Cathodic Protection and Non-Destructive Testing

PERIODICALLY, the Mutual Security Agency issues short digests of new American techniques in the field of engineering and science. Some of these are of considerable electrical interest, and for that reason we are publishing two of the recent items issued.

Cathodic Protection

Because cathodic protection appears to be a practical method for preventing corrosion of oil pipelines and storage tanks buried in the soil or submerged in water, a refinery in America has recently installed such a system to protect nine 100,000 barrel tanks and three 80,000 barrel tanks. The tanks, which were about 25 years old, had developed leaks in the bottoms and suffered severe metal deterioration around the outer rims, from the perimeter inward to a depth of 15 ft, and at joints where roof-support columns contacted bottoms.

The cathodic system involves the continuous flow of electric counter-currents to the structure that is to be protected. To be effective, the current flow from the soil to the structure must be sufficient to maintain a constant voltage of 0·85 between the structure and the copper sulphate electrode in contact with the soil.

The refinery used an 80,000 barrel oil-storage tank for test purposes. Two and a half years after the test installation, test sections of the metal tank showed no active corrosion. Although the tank was not a new one, previous pits and corrosion areas in the test sections had remained inactive during the entire test period. As a result of this test, the method was then applied to the other tanks.

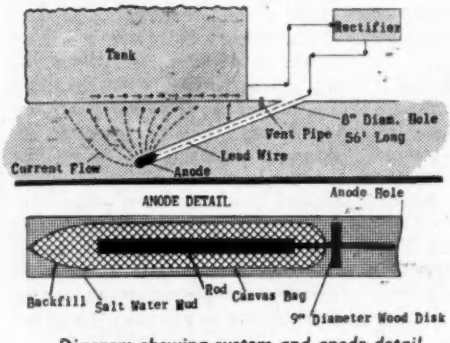


Diagram showing system and anode detail

Current intensity requirements to ensure protection were 1·3 milliamps per sq ft for the 100,000-barrel tanks and 0·76 milliamps per sq ft for the smaller tanks. Line voltage at the rectifiers averaged approximately 14·3 volts for the larger tanks and 7 volts for the smaller ones. Power consumption per month was about 410 kW and 88 kW respectively.

Steel Testing

A practical instrument has been developed for non-destructive testing of certain alloy steels exposed to high temperatures, and may offer advantages to manufacturers of aircraft parts and other equipment. The instrument employs the magnetic permeability of the metal to discover weaknesses in welds and other areas that need patching or replacement. Known as the "Magneprobe" (American Instrument Co., Silver Spring, Maryland), the instrument takes advantage of the fact that certain steel alloys tend to become magnetic as their physical strength decreases. In appearance, it is a box-like device with a meter on its face on which the magnetic variations of the metal are indicated. A probe is connected to the instrument by a 5 ft flexible cable.

Basically, the instrument is a sensitive stable inductance bridge, requiring only 5 watts for operation. The probe forms one arm of the bridge, and an adjustable reference inductance contained within the box forms the other arm. The probe is an inductance coil wound on a core arranged so that the metal to be tested forms part of the magnetic circuit when the probe is placed against it. The inductance of the probe is proportional to the permeability of the metal. The degree of unbalance is indicated on the meter.

In testing heat-resisting alloys suspected of weakness from prolonged exposure to high temperatures, it appears that where the surface areas of such metals reflect values greater than 25 on the meter, a weakness is indicated that requires patching or replacement. In testing welds that have been exposed to excessive temperatures, indications greater than 15 signify weakness in the weld.

Fuller details of cathodic protection are available in "Petroleum Processing" for May, 1952, and of steel testing in "Industrial and Engineering Chemistry" for the same date.

The BUYER'S *Column*

Once Again a G.E.C. Wash-boiler

A GALVANISED wash-boiler is once again being marketed by the GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway, W.C.2. Of improved design, having a cast aluminium rim and polished aluminium lid, the new model is attractive in appearance and competitive in price. It has a capacity of 10 gallons, a loading of 3 kW, and is fitted with two double-pole switches, providing low, medium and full heat. It is supplied with 6 ft of three-core flexible. Overall dimensions of the wash-boiler are: height, 27 in.; width, 19½ in.; depth (including tap), 23 in. The boiler complies with British Standard 1326. List price is £10 12s. An automatic cut-out is supplied as an extra for £1 2s.

G.E.C.'s galvanised wash boiler

B.N.E.'s New C.51 Cooker

DESIGNED specifically to attract the attention of housing authorities and others concerned with large-scale installations on account of its capacity coupled with economy is the new C.51 cooker just introduced by BRITISH NATIONAL ELECTRICS LTD., Newarthill, Motherwell.

Although designed as a low-price model, the C.51 possesses many of the features usually associated with the relatively more expensive models. It has ample oven capacity, actual space being 13½ in. by 13½ in. by 15 in. deep. The two heating elements are carefully positioned, one each side of the oven, to ensure best possible circulation, the oven being fitted with a side opening door.

An important factor from the viewpoint of the supply or housing authority is the ready interchangeability of the hob which is either available as a two-plate type or standard three-plate hob. Space for easy wiring is provided in the two-plate model with position for the third plate control switch suitably blanked off for possible future conversion.

The standard three-plate hob is fitted with 8 in. and 6¼ in. boiling plates and grill boiler, but 6¼ in. or 8 in. radiant plates with three-heat control or simmering control can be supplied as extra alternatives. A large hot cupboard with drop-down door is provided.

Outward appearance is attractive, the flush lines and plinth base being enhanced by two-tone ivory enamel finish instead of the grey mottled enamel which has been used for other models.

For a.c. only, the two-plate C.51 cooker costs £25 10s. and the three-plate model is £28 16s., this price being available only on deliveries of 12 or more cookers.

Loadings are as follows: 1,800 W, oven; 8 in. boiling plate, 1,800 W; 6¼ in. boiling plate, 1,000 W; grill boiler, 2,000 W.

Extras include £1 8s. 6d. for the 6¼ in. radiant plate with three-heat control; £2 4s. for the 6¼ in. radiant plate with simmering control; £1 15s. and £2 10s. 6d. similarly for the 8 in. radiant plate, and 15s. 6d. for a hot plate simmering control.

Bulgin Micro Switches

THE well-known range of Bulgin-Acro micro-sensitive switches, List Nos. S500-505 plain button types, and S506-511 leaf-operated types, made here by A. F. BULGIN & CO. LTD., Bye Pass Road, Barking, Essex, has been extended in application by the availability of the leaf-operated types now fitted with end rollers in the following varieties:

Nickel-plated brass roller (add ../RB to List No.); Graphite compound roller (add RG to List

B.N.E.'s new C.51 is attractively finished in two-tone ivory enamels

No.); Tufnol roller (add RF), and stainless steel (add R.SS).

The advantage of this facility is obvious where mechanisms which operate the switch rely upon a sliding or rotary action.

The characteristics of the switch are well known; briefly they are long life, small operating force required, high current ratings, q.m.b. "snap" action, interchangeability with American patterns and the provision on all switches of s.p.C.-O. contacts to cover on-off, off-on, or C.-O. switching, thus reducing stocking.

These switches are made completely in the U.K. by arrangement with the Acro Co. of the U.S.A., and are interchangeable with all equivalent Acro models which are covered by CSA-8868 and AN/JAN. S-39 Canadian and U.S.A. Standards.

The "Dishmaster"

NOW on the home sales market after a voyage of 13,000 miles from its country of origin is the "Dishmaster" dish-washing machine which, made in New Zealand by an associated company, is marketed here by DISHMASTER (LONDON) LTD., 151 Great Portland Street, London, W.1.

Standing waist high and enclosed in white enamelled sheet metal casing, the machine comprises basically the washing tank into which the crockery in special baskets is loaded and a plastic water impeller at the base of the tank coupled direct to the shaft of a Hoover ½ h.p. electric motor.

The special crockery baskets are covered in a resilient "Geon" type plastic to protect delicate china from breakage and other damage.

This housewife finds her "Dishmaster" a boon

A single rotary control switch controls the hot-water feed and action of the motor. A simple sequence of switching controls the filling of the tank, the action of the water impeller and subsequent drainage of the washing water. It is claimed that the normal amount of soiled dishes used by a family of four in four meals can be washed and dried in under three minutes.

Price in this country is £99 10s. Purchase tax is extra.

Arrow Push-Button Switches

A FURTHER addition to their range of push-button switches has been announced by ARROW ELECTRIC SWITCHES LTD., Hanger Lane, Ealing, W.5.

Arrow's new switch

This new switch, which is similar electrically and mechanically to their existing range, operates pull-on, push-off and is specially designed for panels and dashboard.

It is available with black plastic moulded or nickel plated metal operating knobs and has quick make and break action, being rated 3 amps a.c./d.c.

Knobs in other colours and finishes can be supplied to customers' special requirements.

Price Alterations

AN announcement of price reductions has been made by VEEDER-ROOT LTD., Kilspindie Road, Dundee, manufacturers of precision counting and computing devices. They say that this is due to increased demand and improved manufacturing processes, and that delivery of all products has benefited.

The Truvox tape deck Mark III, as recently announced, is now listed at 22 gns. All enquiries and orders for this equipment should be sent to TRUVOX LTD., Wembley, and not to associated companies.

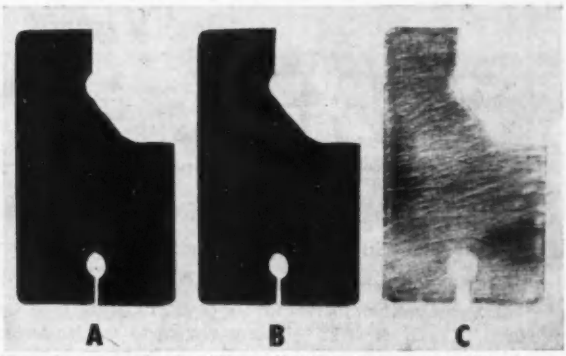
SIMPLEX ELECTRIC CO. LTD., Broadwell, Oldbury, Birmingham, have just issued a price adjustment sheet for Lundberg accessories which amends list LA1912 with effect on all goods despatched on and after November 3, 1952. This reduction, the firm states, is due to a reduction in manufacturing overheads consequent upon the transfer of Lundberg accessories' department to the Broadwell works and the facilities therefore for certain economies in manufacture.

There are also a few more price changes in the Isopad range of electric blankets announced by ISOPAD LTD., 13-17 Rosemont Road, London N.W.3.

The twinheat pad, 16 in. by 12 in., costs now £3 15s., the Master Three-heat £5 5s. Quilted satin covers for the pads, 10s.; for blankets 50 ins. by 30 ins., costs £3 10s., and a new Isoblanket (single heat), £7. All prices include purchase tax.

New Ink Aids Crack Detection

AS a logical development of their two existing flaw detection inks, "Supramor" and "Glomor," MANCHESTER OIL REFINERY (SALES) LTD. have now introduced an ink related to both these earlier types. It will be remembered that "Supramor" is a magnetic ink, available in several colours and used for the detecting surface cracks and subcutaneous flaws in magnetisable materials. "Glomor," on the other hand, is a fluorescent ink which can be used as well for non-magnetic materials, but detects only cracks and pores which have an opening on the surface of the material.



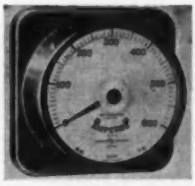
The advantage of using "Lumor" ink is apparent in this photo. A shows the plate in u.-v. light before the application of the ink. B The same plate after application and C the treated plate in white light

The new product "Lumor" is described as a magnetic fluorescent ink, and consists of a fine suspension, in a suitable liquid medium, of a material having both magnetic and fluorescent properties. At a demonstration last week, it was shown to be both adaptable and efficacious. Although this material can be used only on magnetic materials, its indicating properties are enhanced by its fluorescence. Under ultra-violet light, the presence of even the finest surface cracks in a ground surface could be discerned, as shown in the illustration. Its use on another test piece—a welded joint, into which brass had been introduced to simulate a flaw—gave a clear indication of the presence of the brass below the surface.

Two grades of ink are being produced, one having a petroleum base and the other enabling the ink to be used with safety on rubber-bonded steels. Both liquids have a low viscosity to provide mobility of the suspension. Moreover, it is claimed, either ink can be stored without fear of its caking.

C.P. 4″ and 6″ Circular Scale Instruments

SWITCHBOARD moving iron a.c. (C.P.K.A. pattern) and d.c. (C.P.A. pattern) ammeters and voltmeters with 4 in. and 6 in. diameter dials and 240° circular scales are now available from CROMPTON PARKINSON LTD., Crompton House, Aldwych, W.C.2. These instruments incorporate a movement similar to that of the 3½ in. dial ammeters and voltmeters introduced earlier this year. In addition, the new instruments have a moulded plastic case identical with that of the existing C.P. range of wattmeters, frequency meters and power factor indicators.



New C.P. ammeter

The new instruments combine the technical developments of the 3½-in. type movement with the attractive appearance of the moulded case types, and are designed for either flush or projecting type mounting. For flush mounting, a square bezel provided fits closely to the mounting board to restrict the collection of dust.

C.P. instruments designed and constructed in accordance with Admiralty specifications will pass the shock test that consists of beating with a 400 lb. hammer a metal plate on which the instrument is mounted. In this way active service conditions are simulated.

Certain features of design developed to withstand this test are incorporated in all the new C.P. circular scale instruments. The industrial user has the advantage of the same fine quality materials, jewels sprung to protect the pivots from shock, a circular platform scale on a level with the pointer, a form of pointer and other features all conforming generally to the Admiralty specification.

TRADE PUBLICATIONS

RECORDING EQUIPMENT.—Following the success of the Dictorel Magnetic Dictating machine which is marketed in this country by the Trevor Johnson Co. Ltd., 14 Berkeley St., London, W.1, and made by A.C.E.C. of Belgium, Trevor Johnson Co. have now introduced the R.V.A. Airport and Industrial Recorder Unit. An illustrated brochure available from the firm describes the unit.

FLUORESCENT LIGHTING.—An illustrated broadsheet just issued by Thorn Electrical Industries Ltd., 233 Shaftesbury Ave., London, W.C.2, gives details of the firm's equipment and the revised prices with effect from Oct. 23, 1952.

ALUMINIUM.—Of great use to all concerned with metals whether professionally or in study is a book "About Aluminium" published by Northern Aluminium Co., Ltd., Banbury, Oxfordshire. It states clearly and simply the mechanical, electrical and chemical properties of aluminium, its advantages and use in many ways.

LIGHTING FITTINGS.—New lighting broadsheets have been published by Ekco-Ensign Electric Ltd., 45 Essex Street, Strand, W.C.2.

The WEEK in NEWS

Bid to Capture Canadian Market

Electrical Firms in London join New E.I.A. Export Group

A NEW plan is being formulated to capture from the Americans the vast Canadian market for the export of British engineering products. Casual remarks by recent visitors to the N. American continent have created the general impression that Canada has taken the initiative from the U.S. in industrial development, and even in the domestic field the progress appears to be overtaking the high standard of living attributed exclusively to the U.S. Sponsoring the new scheme is the London Regional Section of the Engineering Industries Association, who plan to open an office in Toronto next March which will serve as a liaison between Canada and London, passing back information to British manufacturers and possessing all available details of products useful to Canadian industry. It is hoped that the premises obtained will also accommodate a showroom.

In order to establish such a centre, Mr. S. C. Cosby, assistant regional secretary of the Association, on whose report made as long ago as 1949 this scheme is based, will visit Canada early next month and will go to Toronto finally next March.

Following previous experience, the number of firms participating will be limited. The group, which is known as the Canadian Export Group, will comprise about 40 members. About 1,200 firms in and around London have been circularised, and to date 22 have definitely signified their intention of participating, while a further 50 have shown particular interest and await approval of their boards. Of the 22, at least seven are electrical companies.

The Association has been striving for some years to take advantage of the huge potential of the Canadian market. This latest scheme follows directly the large displays combining numerous U.K. manufacturers which the E.I.A. sponsored at the Toronto Trade Fair in 1949 and 1950.

QUEEN REFERS TO ELECTRICITY IN SCOTLAND

IN the Speech from the Throne at Tuesday's opening of Parliament, H.M. the Queen made one brief reference to the Electrical Industry. Her Majesty said: "The question of the supply of electricity in Scotland is being attentively examined with a view to legislation."

This statement presumably refers to suggestions which have been made for the provision of a strong tie-up between the North of Scotland H.-E. Board and the South East and South West Scotland Boards.

B.E.A. POSTPONES TWO WELSH H.-E. SCHEMES

PLANNING authorities in N. Wales have been informed by the B.E.A. that a Bill promoting two hydro-electric projects will not be put before Parliament during the present session. The two projects concerned in this decision are the scheme at Rheidol and the revised scheme at Ffestiniog. Reason given is capital restrictions.

Meanwhile it is intended to proceed with the extensions to the existing Dolgarrog and Maentwrog schemes which have already received Parliamentary sanction. Preliminary drawings are ready for presentation to local authorities and to the Royal Fine Art Commission. We understand that tenders are likely to be invited in the New Year. The cost of these two schemes was referred to in the House last week (see page 854).

The decision to omit the Rheidol scheme will be a blow to the Merseyside and N. Wales Consultative Council, who have made representations seeking its inclusion following early intimation that the project might be held over.

The First Half-Century

After a week's consideration the L.C.C. has withdrawn its ridiculous proposal to promote a Bill next session empowering it to provide London with underground railways. As implied last week, the task of preparing plans and drafting a Bill in the few weeks available is palpably impossible. The Council's new move is to ask for a Commission to go into the whole subject of tubes, shallow underground subways and what not for the London area; all privately promoted tube Bills to be held over until the Commission shall have reported. A deputation will urge this course upon the President of the Board of Trade. It is significant that the Council's credit in the money market was prejudiced by last week's ill-advised excursion into the tube business. That reason alone would have proved enough to make the Council beat a hasty retreat.—*From our issue of November 6, 1902.*

Are Southern Board's Tariffs Legal?

LOCAL ASSOCIATION QUERIES VALIDITY OF NEW CHARGES

A SUB-COMMITTEE of the newly formed Gas and Electricity Users' Association at Bournemouth has queried the legality of the Southern Electricity Board's existing charges. The committee's report on the subject was accepted but comments and criticisms were held over pending the recovery of the chairman after illness.

The sub-committee maintains that the Board has failed to comply with the Act in that it has not shown the methods by which, and the principles on which, the charges were to be made. Having a free hand to fix new tariffs, it was bound to comply with that proviso, it is contended.

A second charge against the Board is that of undue discrimination. People in large houses will be forced to pay more per unit than those in small houses. It is claimed, therefore, that the tariff is not valid, and consequently the charges under it are also invalid. The Board has not as yet commented on the allegations.

The Association has also pointed out that the whole system of power cuts may be illegal, in that the Board is not allowed to vary the voltage at the terminals by more than 6% either way.

COMMENTS SOUGHT ON WIRING RULES

AN invitation is now being extended by the I.E.E. for comments on the 12th edition of Wiring Regulations which was issued in May, 1950. As there have been a number of developments in wiring practice which have matured since the publication of the 12th edition, and because a number of matters have been found in need of review, the Council of the Institution have decided that the drafting of a 13th edition should now proceed. Those comments should reach the secretary of the I.E.E. before the end of this year. We understand that the new edition will not be issued before 1954.

At the time the I.E.E. issued their interpretations of this latest edition (see our July 24 issue) it was suggested that some other organisation should issue in simple form a practical booklet listing relevant interpretations. This has now been done by the Electrical Contractors Association. Each interpretation applying to a separate Regulation has a separate loose-leaf page or pages, and interpretations issued in the future will be made available for insertion in the binder. Copies may be obtained from the E.C.A. at 1s. 6d. each.

Content Value Reduced in Exported Copper Goods

THE value of the copper or copper alloy content of some goods exported to destinations other than China, Hong Kong and Tibet under open general licence has been reduced. As from last Monday the export of these goods is allowed if the value of the items exceeds the value of the content calculated at the rate of £430 per ton of copper and £350 per ton of alloys mainly of copper. Previous values were £500 per ton, and £420 per ton respectively, and £400 per ton for copper cable and wires. This licence applies to goods specified in Group 6 (2) of the First Schedule to the Export of Goods (Control) (Consolidation) Order, 1952.

COPPER STRIKE AFFECTS U.K. DELIVERIES

THE strike of African workers in the N. Rhodesian copper mines, previously reported in these columns, is having its effect on supplies to this country. The strike is now over two weeks old. It was announced on Friday by the Ministry of Materials that forward purchases for December delivery would, for the time being, be limited to three-quarters of this month's allocations. No reduction is proposed in respect of November deliveries, and it was hoped that deliveries in December would be unaffected. The Ministry will make a further announcement concerning these in due course.

SOME METAL CONTROLS REMOVED

IMPROVED supplies have resulted in the revocation of controls which permitted licences for the import of certain ferro-alloys to be granted only to the British Iron and Steel Federation. As from January 1 next licences will be issued to individual firms provided application is made to the Board of Trade. This was announced by the Minister of Supply last week. Alloy metals affected are ferro-silicon, ferro-chrome, ferro-silicochrome, silico-manganese, silico-spiegel, ferro-phosphorus and calcium silicide.

Large Scope for Increased Productivity

ADDRESSING the Institute of Industrial Administration in Liverpool last week, Sir Thomas Hutton said that judging from reports of the Anglo-American Productivity teams, much could be done with little expenditure, to increase the productivity of the average firm. Sir Thomas is general manager of the U.K. section of the Anglo-American Council on Productivity. He said something had to be done soon to make large capital expenditure possible, and added that he believed economists maintained that this could only be done by having a surplus of production over consumption or a reduced standard of living. There was huge scope for increased productivity in Britain provided obstacles and disincentives were removed or at least an indication of their possible removal was given, said Sir Thomas. He also said the new British Productivity Council should be able to make an important and valuable contribution towards increased production.

Norway's Ambassador sees New H.E. Plant

IN view of the development of hydro-electric power in Norway over the past 50 years, during which time the country has been rapidly changing from agriculture to industry, it was perhaps significant that H.E. the Norwegian Ambassador should visit the British Thomson-Houston Co., at Rugby. In the course of his tour of the works he saw a 14,000 kVA 11kV, 500 r.p.m. horizontal waterwheel alternator being made for the Oldreid power station. Similar equipment now being made at the factory is destined for Uganda and Spain, while only a month ago, an alternator was shipped to Norway for the Bardufoss station.

M. Per Preben Prebensen's visit coincided with the 16th annual gathering of the B.T.H. Overseas Association, at which function he was principal guest. In his response to the toast "Our Guests," M. Prebensen gave an admirable word picture of his country, past and present.

The Norwegian Ambassador inspecting the winding of the stator for the 14,000 kVA waterwheel alternator on order for Oldreid power station. He was visiting the B.T.H. works at Rugby

Co-operation Urged at E.C.A. Branch Dinner

AT the annual dinner of the Leicester branch of E.C.A., Mr. R. J. Halliwell, national vice-president, suggested that the night use of electricity should be encouraged in order to keep the price of electricity at a reasonable level. The B.E.A., he said, should arrange the utilisation of night tariffs, manufacturers the necessary apparatus, and contractors should persuade clients to take advantage of the tariffs. Mr. Halliwell urged co-operation of all sections of the industry. An increase in cost would mean a further reduction in consumption and consequently a loss in trade.

The dinner was attended by about 250 and was followed by a dance. Mr. R. C. Spencer, branch chairman, presided, and among the guests was Mr. John Mould, deputy chairman of the E. Midlands Board.

More South Americans to receive British Training

ENTHUSIASTIC recommendations in the report of the British Engineering Mission to Latin America, presented on Monday, have resulted in an immediate offer by the Federation of British Industries of fifty overseas scholarships to be divided among the nine countries visited. It is felt that the minimum target should be 100 scholarships each year for Latin America, with a proportionate increase for Commonwealth and other countries.

A modification of the original scholarships is intended for Latin American engineers. In addition to suitable post-graduate engineers, it is proposed that young University professors or lecturers should also be included in the scheme, in an attempt to ensure that a sound knowledge of British engineering practice is firmly established. Emphasis throughout is on practical experience, and as Latin American training in engineering is largely academic, this offer has been widely appreciated.

NEW COMMITTEE for TV DEVELOPMENT

IT was announced in the House of Lords last week that the Television Advisory Committee has been reconstituted to advise on the development of TV and sound broadcasting at frequencies above 30 megacycles per second. The committee's work will also cover competitive TV services and television for public showing. Admiral Sir Charles Daniel has agreed to act as chairman. Other members include Sir Edward Herbert, Mr. Charles McLaren, Mr. E. M. Fraser, Mr. G. Darnley Smith and Mr. C. O. Stanley.

OFFICIAL PUBLICATIONS

ALUMINIUM SCRAP PRICES ORDER (*No.* 3) (*Revocation*) *Order*, 1952. S.I. 1902. (*See page* 852.) H.M.S.O. 2d.

TELECOMMUNICATIONS. *Supplementary agreement to Final Act of Commonwealth - U.S. Telecommunications Meeting, Aug.*, 1949. H.M.S.O. 4d.

IRON AND STEEL DISTRIBUTION SCHEME. *Alloy and Non-Alloy Material.* H.M.S.O. 2d.

RADIO RESEARCH BOARD. *Report for 1951 published by D.S.I.R.* H.M.S.O. 1s. 6d.

FUEL DEBATE ON THE AIR TONIGHT

THIS evening's debate in the B.B.C.'s Home Service programme, "Taking Stock," will be on the national fuel policy and the recent report of the Ridley Committee. The list of speakers published in the current edition of *Radio Times* names Mr. Alfred Robens, former Parliamentary Secretary to the M. of F. and P., Mr. G. Nabarro, Sir Vincent de Ferranti and Mr. W. L. Boon of Powell Duffryn. Reaction in some quarters to the programme has been that the publicised list of speakers is unbalanced in its presentation of the case for electricity. Although efforts were made to persuade the B.B.C. to supplement or modify the list of speakers taking part, we understand no alterations are to be made.

Record Attendance at Old Faradian's Dinner

IN accordance with custom, the toast of "Faraday House" at this year's annual dinner of the Faraday House Old Students' Association was proposed by the President of the Institution of Electrical Engineers. The dinner, which was held last week at the Savoy Hotel, attracted a record number of Association members and guests. Col. Leeson, in his speech, recalled that the industry looked back on great progress during some 50 years of activity. Although half the industry was nationalised, and the remainder still part of the private enterprise sector, the partnership was exceedingly strong. Associations such as the F.H.O.S.A. were all-important in ensuring that this was so.

Electrical manufacturing was the third largest export industry, and exports were vital to the country's well-being. But this industry could not go ahead faster than other industries to which it was linked. Longer hours of working with the facilities we have seemed essential, if unpopular.

Col. Leeson was followed by Dr. Coode-Adams, who as usual gave a witty review of the College in relation to general affairs. Principal guest of the evening was General Sir Ouvry Roberts, the Quartermaster General, who had some interesting things to say on the army's need for technical officers.

Radio Commentating at Batti-Wallahs

MR. REX ALSTON, well-known B.B.C. sports commentator, was principal guest at the Batti-Wallahs luncheon last Wednesday, when he spoke on the difficulties of keeping a running commentary going when there was virtually nothing to talk about.

Next luncheon will be on November 26, when Viscount Hall will be principal guest. Annual dinner-dance is to be held on March 18 at the Connaught Rooms.

ALADDIN'S CAVE LIT BY U.V. FLUORESCENT TUBES

AN attractive display incorporating the use of Thorn Electrical Industries Ltd.'s dimmer control unit and ultra-violet fluorescent lamps has been constructed in the Croydon showroom of Drubel Distributors Ltd. The illuminated display depicts the interior of Aladdin's cave gaily decorated with fluorescent paints. Fluorescent tubes in blue, red, yellow and ultra-violet have been placed at either side and centre. The control unit, resembling the company's now famous stage lighting installation, then rings the changes between the colours, from the bright yellow to the mysterious ultra-violet, the last probably being the most effective.

WORK ON EDINBURGH'S NEW ELECTRONICS LAB. MAY START NEXT YEAR

READERS will probably recall notes in these columns concerning the erection of a new electronics laboratory in Edinburgh. Recent reports from that city indicate that Ferranti, Ltd., hope to see work started on the £195,000 building before the end of this year. The laboratory will adjoin the Ferranti factory at Crewe Toll, and its main purpose is to enable the Scottish Council (Development and Industry) to expand their electronics group scheme.

These new premises will have a total floor area of about 53,000 sq ft. There will be two wings, each of three floors, leading off a small, central, administrative block. As much space as possible is to be devoted to laboratories, but there will be two large drawing offices on the first and second floors, with a total area of about 10,000 sq ft, and lighted by a continuous window passing through two floors.

E.I.B.A. FULL HOUSE

THOSE who have not yet applied for tickets for the Electrical Industries Ball to be held at Grosvenor House, Park Lane, on November 14, will probably be unlucky. It has been reported from E.I.B.A. headquarters that all tickets have now been sold.

Illumination Courses

The Illumination Design Courses organised periodically by E.L.M.A. in various parts of the country are proving increasingly popular. Applications for tickets for the courses taking place this autumn in London, Leeds and Glasgow have been in excess of the accommodation available, and plans are in hand now to duplicate the series of lectures. Dates for the duplicate courses have not yet been finalised, but as far as London is concerned it is unlikely that they will be held before January. Our picture shows the opening lecture of the London course.

Our picture shows Sir Joseph Hallsworth inspecting the plate pasting department during a visit to Chloride Batteries, Ltd.'s Swinton, Manchester, works. Sir Joseph was accompanied by engineers and executives of the N.W. Electricity Board. With him in the picture are Mr. O. Howarth, chief engineer and Mr. A. O. Johnson, chief commercial officer

Devon Wins Display Award Again

RESULTS of the South Western Electricity Board's 1952 Display Competition, announced last weekend, show that for the third successive year the principal award has been won by a service centre in the Board's Devon sub-area. The trophy has been awarded, this year, to Torquay, and second and third prizes have been won by Penzance and Taunton respectively. In the two preceding years, as mentioned in these columns last week, the area challenge cup was won by Dartmouth (1950) and Bude (1951). Dartmouth qualified for the final round this year.

The scope of the latest competition was widened to include the showroom interior. It is to be noted that each of the four finalists in the Taunton sub-area received an award of some kind.

IN SUPPORT OF ELECTRIC TRANSPORT

THE advantages of motor buses, trolley buses and trams are the subject of much discussion in a number of Scottish towns just now, notably in Edinburgh, Glasgow and Aberdeen. At a meeting in Aberdeen recently the view was expressed that the town would have to rely on a form of electric transport to clear the transport deficit.

Motor buses were running at a loss, said a local councillor. It was cheaper to operate trolley buses and consequently that mode of conveyance would have to be developed. He maintained that as trams were scrapped and buses introduced, so the financial deficit rose.

Tariffs in South Wales Explained

THERE has been considerable discussion in the S. Wales Electricity Board's Area in recent months concerning rural electrification, and not a little on the new tariff. A number of protests have been forthcoming from local organisations. The Consultative Council's chairman has recently issued a statement on the tariff dispute in an endeavour to clear up any misunderstandings in that respect.

Mr. C. L. Hilton states that the Council would have to receive many more consumers' opinions before the matter is discussed at their meetings. Very few queries had been received to date and it was therefore difficult to judge the true reaction. It is pointed out that the Council intends to conduct a review of the effect of the new tariff as soon as an assessment of the results can be formed. The Board have also announced their intention to conduct a similar review.

In the course of the review the Council would consider any representations received.

NEWS IN BRIEF

Fluorescent street lighting for a number of streets in the City of London is under consideration. If a scheme now before the Streets Committee is approved, work will start on the project early in the next financial year.

Annual dinner of the Electrical Wholesalers Federation is to take place at the Dorchester Hotel, London, on March 19, 1953.

Old N'Ions Association will be holding their silver jubilee annual dinner and reunion on November 28 at the Connaught Rooms, London. Guest of honour will be Lord Eustace Percy.

Royal Photographic Society has published *High-speed Photography*, a special number of the Scientific Section of *The Photographic Journal*.

The Minister of Supply has removed price control on aluminium scrap. The relevant Order took effect from November 1.

The progress of the drive for steelmaking scrap was given at a Press conference organised by the British Iron and Steel Federation last Friday. In general, estimated figures for 1952 show an encouraging increase over the preceeding year—an indication of the intensified campaign launched by the Minister of Supply earlier this year.

Fifth annual dinner of the London Power Staff Reunion Association will take place on December 5 at Tavistock Restaurant, London.

In the table reviewing Area Board accounts on page 681 of our issue of October 16, the revenue from domestic tariffs of the S.W. Scotland E.B., was given incorrectly. It should have been 1·13d/unit, instead of 1·29 as stated.

Electric Supply News . . .

Banbury

Dissatisfaction with the Midlands Electricity Board for failing to connect a supply to Council houses at Tadmarton was expressed at a recent meeting of the Banbury Rural District Council. Mr. W. G. Harvey, the representative for Tadmarton, said the houses had been wired up internally for nearly three years, but despite repeated applications, the Board had failed to connect up the supply.

Belfast

An additional £926,750 is required by the Corporation Electricity Committee for the initial installation at the new Victoria power station and associated distribution works on the station site. The original estimated cost was £4,215,750. The Committee recommend that application be made to the Ministry of Commerce for sanction to raise the supplementary loan to meet the extra cost. In a memorandum, Mr. R. P. Watson, acting city electrical engineer, reports that since the original estimates were prepared some of the values of equipment and labour have increased, and in May last, the consulting engineers prepared revised estimates amounting to £5,142,500 which exceeds the expenditure already sanctioned by £926,750. The revised estimates show that the amount for civil engineering works is up by £293,500 to £1,372,050, and the new figure for plant and foundations is £3,770,450, an increase of £633,250.

Haltwistle

The Rural Council has approved plans for the erection of o.h. power lines to serve Knaresdale, Burnstones and Slaggyford.

Hayes (Middx.)

The Southern Electricity Board is being asked to provide a supply to the Botwell estate at Hayes, where, it is reported, 1,000 houses have been without electricity since they were erected in 1920.

Houghton-le-Spring

The U.D.C. has approved plans by the North Eastern Electricity Board for new l.v. overhead lines in connection with the reconstruction of the network in Houghton-le-Spring.

Northumberland

A twenty years' development plan for Northumberland drawn up by the County Council states that it was proposed to erect a new power station at Cambois, Blyth, and high voltage lines to carry power from the new Newburn-on-Tyne power station along the Tyne Valley to Greenhead and also to Blyth.

N. Ireland

Questioned regarding rural electrification, Mr. McCleery, Minister of Commerce, stated in the Ulster House of Commons, that discussions were still going on between his Ministry, the Minister of Finance and the Electricity Board for Northern Ireland on the whole question and the possible methods of dealing with that difficult problem. Therefore he was not in a position to make any further statement on the matter.

Tipton

For some months the Tipton Corporation and the Midlands Electricity Board have been arguing about the appearance value of an outdoor substation which it is proposed should be erected on the New Park Lane West estate. The Corporation has maintained that the substation should be brick built, but the Board has rejected that request on the grounds of expense.

LIGHTING SCHEMES

Bury St. Edmunds.—Borough engineer to prepare a scheme for improved lighting of trunk road A.45.

Gosport.—T.C. is recommended to apply for sanction to borrow £8,989 for the installation of sodium discharge street lighting between Ferry and Brockhurst cross-roads.

Nottingham.—It is proposed to erect 58 concrete columns with 140 W sodium lamps in Wilford Lane and Clifton Lane, at a cost of £6,435.

Old Kilpatrick.—M.o.T. has approved the expenditure of £5,000 on electrification of street lighting in the area comprising Old Kilpatrick, Bowling, Milton, Duntocher and Hardgate during the present year and for a further £5,000 next year.

Pittenweem.—The burgh surveyor is to make inquiries into the cost of installing electric street lighting. In all 52 columns would be required.

Plymouth.—The M.o.T. has indicated that it is now prepared to give favourable consideration to the raising of a loan of £2,863 for the provision of h.p.m.v. lighting in Alma Road.

Retford.—The town council has approved the conversion of 50 gas lamps to electricity on the Hallcroft estate and in Chancery Lane, Exchange St., Savile St., West St., and Ordsall Rd.

Scarborough.—The T.C. is recommended by the Water and Streets Committee to convert the remaining 1,933 gas lamps in the town to electricity. The cost is estimated at £80,000.

Sevenoaks.—Proposals that gas street lighting should remain and that the existing contract be extended have been deferred by the U.D.C. for further consideration. The Highways Committee is seeking the views of the M.o.T.

Spalding.—The M.o.T. has approved the third stage of the U.D.C.'s street lighting conversion scheme.

Questions in Parliament . . .

Home Production of Tin

Two questions have been asked by Mr. R. Stokes concerning the production of tin in this country. He wanted to know, firstly, what steps were being taken to increase output from the indigenous resources of Britain. In reply it was stated that any sound and practical proposals to increase output in the U.K. would be considered. Mr. Stokes also asked whether any tax relief was being considered to increase U.K. production of non-ferrous metals, particularly tin. He was reminded that provisions had been made for new allowances to be given to mining concerns incurring certain kinds of expenditure.

Loughborough College

Readers will no doubt recall the report in our October 23 issue (page 755) concerning the changes in status and organisation of Loughborough College. Questioned concerning the changes last Thursday, the Minister of Education said the engineering and science departments had ceased to be maintained by the Leicestershire local authority and had become a separate establishment as from September 1. It would be known as the Institute of Technology, Loughborough College, and would be controlled by an independent governing body receiving a direct grant. Other departments of the college remained unaffected.

Asked if the change would constitute a precedent for technical colleges of national repute, the Minister said she thought each case should be dealt with on its merits.

Electricity Charges

The Minister of Fuel and Power was asked last week if he could give details of the rise in prices and charges for fuel and power since October 1 last year. Replying, he said it was not practicable to give such details, as prices varied with the locality. Data collected by the Ministry of Labour showed average increases in retail prices between September 18, 1951 and last September, of 13% for electricity, 9% for coke and gas, and 8% for coal.

Development of TV Service

A number of questions were again asked last week concerning the development of television services in various parts of the country. As regards coverage in N. Ireland, Mr. D. Gammans stated that the temporary station near Belfast was unlikely to extend into Londonderry.

In view of the comparatively small cost of erecting a temporary TV booster station, would the construction of a station at Princetown be allowed. In reply, it was stated that such a station's limited range would not give the service.

Further to his statement reported last week in these columns, Mr. Gammans said he had had two applications for TV rediffusion service and two for radio boosters. Improved reception in fringe areas was being considered, he said.

Tax on Radio Relay Apparatus

Mr. J. Boyd-Carpenter made a statement last week concerning the implications of the Order extending purchase tax to cover all radio and TV relay equipment. Briefly the effect of the order was to place beyond doubt the fact that relay apparatus was treated in the same way as regards purchase tax, as the ordinary wireless receiving set or radio-gramophone. The Purchase Tax (No. 2) Order, 1952 (S.I. No. 1423) was approved.

N. Wales H. E. Projects

Mr. Geoffrey Lloyd stated last Thursday that he had been informed by the B.E.A. that the estimated capital cost of the extension to the Dolgarrog hydro-electric establishment in N. Wales was £538,000. There would be an increase in installed capacity there of 10,000 kW. The Maentwrog extensions were estimated to cost £565,000. There was to be no increase at Maentwrog, the extension being intended to allow more units to be generated from existing plant.

Asked whether he had sanctioned the introduction of further private Bills to give legislative effect to proposals, Mr. Lloyd said he understood the B.E.A. had not yet made a decision.

Company Activities . . .

British Electric Transformer Co., Ltd.

A fall in the net profit is recorded in the preliminary statement for the year to June 30 last. The figure is £34,059, which is £9,730 below the previous year's total. The dividend is 1s. 10d. on the 5s. Ordinary share, as against 2s. 5d. for the preceding year when a special 10% tax-free dividend was paid from tax recovered in respect of previous years.

Cable and Wireless (Holding)

The creation and issue of the new 5% debenture stock was approved by loan stockholders at last Thursday's meeting. Under this scheme £3,632,662 5% debenture stock, 1972/77, will be issued for conversion or repayment at par on December 1 next of the same amount of the outstanding 3% Loan Stock. At the same time the 3% and 4% Loan stockholders and Ordinary

stockholders are being given the right to apply for any balance of the issue remaining after satisfying the conversion applications.

Christy Bros. Ltd.

A rights offer of 50,000 £1 Ordinary shares at par, as foreshadowed in the annual report last September, is announced by the directors. Holders are to be allowed to take up one new share for every four held. Applications may also be made for excess shares.

Crabtree Electrical Industries

With a final Ordinary dividend of 10%, the total distribution for the year is again 17½%. The preliminary statement records that tax-free dividends totalling £90,000 have been received by the company from its subsidiaries, and dividends paid or recommended absorb a total of

Year to Jul 31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	Paid	Ord. Price High	Low
1948	280,932	135,716	38	17½	46/6	37/3
1949	246,624	122,846	34	17½	43/6	31/3
1950	368,757	135,939	38	17½	39	32
1951	461,310	149,910	46	17½	44/3	33/9
1952	363,579	114,494	33	17½	36/-	30/-

£64,313. The reduction in trading profit bears out the warning given to shareholders in the interim statement last February.

Crompton Parkinson Ltd.

After charging depreciation, taxation and provisions, the consolidated group net income for the year to June 30 is £397,934, an increase of over £36,000. The final Ordinary dividend recommended is 3¾% plus special cash bonus of 3¾%. This information is given in the preliminary statement, from which it seems that changes have been made in the form of accounts. These necessitate postponing publication of our comparative table till more data is available.

Ferranti Ltd.

The trading profit for the year ended June 30 last was over £100,000 more than that for the previous year, but this has been offset by the increased provision for taxation, as will be seen from the table below. With the Ordinary dividend again at 6%, the total distribution for the year is less than 10% of the net profit. Allocated a further £300,000 (*£450,000 last year*) the general reserve account now stands at £1,200,000. Output of the group during the year was 30% higher than for the previous period. Production of power transformers alone was 26% up, and for

Year to June 30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	Paid	Ord. Price High	Low
1948	462,892	181,708	*54	*6		
1949	437,161	133,027	*38	*6†	All held	
1950	718,969	248,100	77	6		
1951	1,427,467	540,129	192	6	privately	
1952	1,531,832	529,208		6		

* Tax free. † Capital bonus 233⅓%.

instruments and special metering equipment, 21% higher. There has been a steady increase in orders received during the twelve months, Sir Vincent Z. de Ferranti, chairman, states, and at June 30 last there was a record order book of over £15 million. Further extensions of manufacturing facilities are in hand, and work is also proceeding on new research laboratories at Wythenshawe.

Herbert Morris

The consolidated trading profit, plus other income, for the year to July 31 last, at £620,227 is some £60,000 less than for the previous period. This figure is arrived at after deducting depreciation. The final Ordinary dividend is again 15% plus bonus 5%, both tax-free, making 25%.

Dividends Declared

Brazilian Traction Light and Power.—Final dividend of 50 cents (Canadian), making $1 per share (*same*).

W. Canning and Co.—Interim of 10% (*same*) payable on November 29.

Garrard Engrg. and Manfg. Co.—Interim of 10% (*same*).

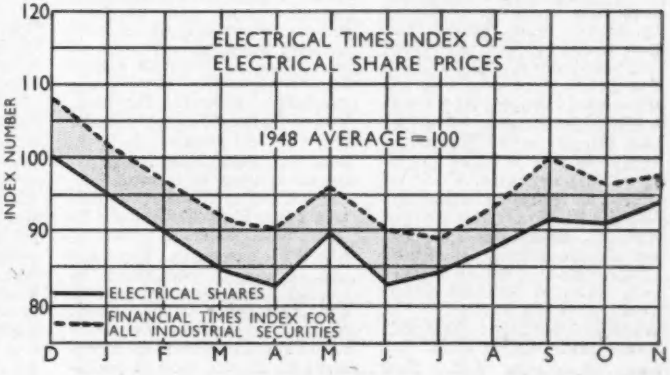
Paterson Engineering Co.—Dividend of 10% plus bonus 5% (*both same*). Group net profit, £67,692 (*£44,098*).

Pressed Steel Co.—Interim of 7½% (*same*).

J. Stone and Co. (Holdings).—Interim of 5% (*same*).

G. and J. Weir Ltd.—Interim of 5% (*10%*) payable on November 26 on trebled capital.

The upward trend in share prices, halted temporarily during September, has been resumed. At the end of October both indices had risen, the "Electrical Times" index for electrical shares by as much as 2·5 to 94·00. A similar rise, though not so marked, was shown in the "Financial Times" index for all industrial shares. Latest figure is 97·4 compared with 96·8 at the end of September. The figures are based on the average prices ruling in 1948



Commercial Information

CONTRACTS OPEN

HOME

Nov. 10.—Abergavenny (Mon.). Electrical installation in hall at Ty-Mawr school, Gilvern. R. Graham Lucas, headmaster.

Nov. 10.—Birmingham. Alterations and additions to lighting and power installations at Highbury Hall. H. J. Manzoni, City Engineer and Surveyor, Civic Centre. Deposit £2 2s.

Nov. 10.—Leyton T.C. Provision and fitting of 40 dish refractor lanterns with magnetic deflector for 400 W H.P.M.V. lamps; also supply and erection of six concrete columns. Borough Engineer and Surveyor, Town Hall. Deposit £2 2s. (See Oct. 30 issue.)

Nov. 10.—Mablethorpe and Sutton U.D.C. Supply, erection and maintenance of pumping machinery for unscreened sewerage, each set complete with electric motor and automatic switchgear. Documents from Council Offices or from consulting engineers, Silcock and Simpson, 10 Park Row, Leeds. Deposit £5.

Nov. 10.—Radcliffe T.C. Installation of electrical services in 60 houses and 12 maisonettes in Milton Rd. scheme. Borough Engineer and Surveyor, Town Hall.

Nov. 10.—Sunderland T.C. Supply of equipment for lighting pedestrian crossings including 72 flasher units, plastic and glass beacon globes, steel poles and lampholders. Town Clerk, Town Hall. (See Oct. 30 issue).

Nov. 10.—Wortley (Yorks) R.D.C. Installation of wiring and fittings in 60 houses at Tankersley. A. Wikeley, engineer and surveyor, Council Offices, Grenoside, nr. Sheffield. Deposit £2 2s.

Nov. 11.—Bridgwater T.C. Supply and installation of electric motor with ancillary switchgear and cables at Ashford waterworks pumping station. R. A. Watson, Borough Engineer, Town Hall. Deposit £1 1s.

Nov. 11.—Luton T.C. New sodium lighting scheme in Biscob and Cromwell Rds., and tungsten lighting in Lea Rd., including erection of concrete columns, wiring and control equipment. Borough Engineer, Town Hall. Deposit £2 2s.

Nov. 12.—Carlisle. Supply of 53 flashers, housings, globes, lamps, etc., for 230 V a.c. 50 c/s supply for pedestrian crossing lighting. H. D. A. Robertson, Town Clerk, 15 Fisher Street.

Nov. 12.—Morecambe and Heysham T.C. Supply only of equipment for lighting 12 pedestrian crossings. Borough Surveyor, Town Hall.

Nov. 12.—Wandsworth. Supply of about 205 sets of equipment for lighting pedestrian crossing beacons. Borough Engineer, Municipal Buildings, S.W.18.

Nov. 14.—Meath. Electrical installation at Proudstown Park Racecourse, Navan. J. A. Kenny and Partners, consulting engineers, 44 Kildare St., Dublin. Deposit £5 5s.

Nov. 17.—Armagh. Electrical installation at Armagh Girls' High School. J. R. W. Murland, 13 Wellington Place, Belfast. Deposit £5 5s.

Nov. 13.—East Ham T.C. Provision of equipment for illumination of 36 pedestrian crossings. Borough Engineer, Town Hall, London E.6.

Nov. 13.—Southall T.C. Provision of 63 lanterns with 140 W sodium lamps and ancillary equipment, and also 63 concrete columns including erection and installation of electrical equipment. These may be separate contracts. Borough Engineer, Town Hall. Deposit £2 2s. (See Oct. 30 issue.)

Nov. 14.—Manchester. Electrical installation in Central Kitchen, Crossley St. City Architect, Town Hall. Deposit £1 1s. (See Oct. 16 issue.)

Nov. 17.—Edinburgh. Electrical and heating installations in Carrick Knowe primary school. City Architect, City Chambers.

Nov. 17.—Sevenoaks T.C. Provision and installation of equipment for illumination of pedestrian crossing beacons. Engineer and Surveyor, Council Offices, Argyle Road.

Nov. 17.—Stretford T.C. Electrical installation in 146 flats and maisonettes on Stretford Rd. and Thomas St. sites. A. H. Perry, Borough Surveyor, Town Hall. Deposit £2 2s.

Nov. 17.—Sunbury-on-Thames U.D.C. Wiring and equipping for lighting of about 32 houses in Nursery Rd. and Layton's Lane. Engineer and Surveyor, Council Offices.

Nov. 17.—West Riding. Conversion from gas to electrical installation at Wombwell Park St. J.M. school. County Architect, "Bishopgarth," Westfield Rd., Wakefield.

Nov. 18.—Ilford T.C. Supply of 20 a.c. and 20 d.c. flasher units with housings and 20 housings for interconnecting with d.c. flashers; and also 60 globes, galleries and lampholders for pedestrian crossing lighting. Borough Engineer and Surveyor, Town Hall. Deposit £2 2s. (See Oct. 30 issue.)

Nov. 18.—Musselburgh. Erection of 69 lamp standards and installation of mercury lamps in Pinkie Braes scheme. Burgh Surveyor, Municipal Offices, High Street.

Nov. 19.—Tyrone. Electrical installation at Kilskerry primary school. A. Gibson, chief education officer, Education Offices, Omagh. Deposit £2 2s.

Nov. 21.—Belfast. Supply and erection of workshop machinery equipment, including 12½ in. and 6½ in. centres surfacing and screwcutting of gap bed lathes, radial drilling machines, sensitive drilling machine, and 24-in. shaping machine, for Harbour power station. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See Oct. 23 issue.)

Nov. 22.—Wakefield R.D.C. Electrical installation in 58 houses on sites within the rural district. Council's Engineer, Council Offices, 18 St. John's North.

Nov. 24.—Nuneaton T.C. Provision and installation of sodium street lighting over about 1,530 yds. to Group A standard. Borough Surveyor, Council House. Deposit £2 2s. (Advertised in this issue.)

Nov. 24.—West Riding. Modifications and repairs to electrical installations at Holme Valley grammar school. County Architect, "Bishopgarth," Westfield Rd., Wakefield.

Nov. 24.—Boston R.D.C. Electrical pumping machinery required for Bulterton Re-Pumping Station. S. M. Forman, clerk of district council, 126 London Rd. Deposit £3 3s.

Nov. 25.—Newbiggin-by-the-Sea U.D.C. Electrical work in 12 houses on Spital Estate. H. Selby Robson, Surveyor to Council, Council Offices. Deposit £2 2s.

Nov. 28.—Stepney B.C. Electrical installation in blocks of flats in Sidney St. scheme. Sydney Clough, Son and Partners, Devonshire Close, 39 Devonshire St., W.1. Deposit £2 2s. (See Oct. 23 issue.)

Nov. 29.—Stalybridge T.C. Conversion of street lighting from gas to electricity, comprising supply of swan necks to existing columns, new concrete columns, 80 W H.P.M.V. lanterns, time switches, etc., for some 420 lamps. G. D. Sanderson, Borough Engineer, Town Hall.

Nov. 30.—Tottenham B.C. List of supplies required during year beginning April 1, 1953, includes electric lamps. Applications to M. Lindsay Taylor, Town Clerk, Town Hall, N.15.

Dec. 1.—Chippenham. Rewiring for power, lighting, patients' call system and radio system at St. Andrews' Hospital. A. N. Irens, consulting engineer, Haycroft, Filton, Bristol. Deposit £2 2s. (Advertised in this issue.)

Dec. 10.—Ilkley U.D.C. Installation of mercury lighting (involving 62 columns) in new street lighting scheme. Council's Surveyor, Town Hall. Deposit £3 3s.

No date stated.—Midlothian. Electrical installation at new primary school and clinic at Danderhall, Dalkeith. County Architect, 32 Palmerston Place, Edinburgh.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horseguards Avenue, S.W.1, quoting reference.*

Nov. 15.—Egypt. Cairo Electricity and Gas Administration requires supply of 395,000 yd of various cables with working voltage of 250 V. Administration is at 53 Fouad El-Awal St. B.o.T. (Ref. CRE 36263/52).*

Nov. 20.—Uruguay. Supply of single-phase transformer, air-cooled, 220 primary winding, 110 secondary winding, apparent potential 20 kVA, secondary winding current 180 A. Frigorifico Nacional, Seccion Adquisiciones, Calle Piedres 361, Montevideo.

Dec. 17.—Australia. Supply and erection of ash disposal plant for Yallourn power station, for State Electricity Commission of Victoria. Full particulars available from office of Agent-General for Victoria in London.

Dec. 26.—India. Supply of ceiling and table fans, a.c. and d.c., on rate contract basis, for 13 months beginning March 1 next, for Directorate General Supplies and Disposals, Shalijahan Rd., New Delhi. B.o.T. (Ref. CRE 35128/52).*

Jan. 14, 1953.—Australia. Six boiler feed water pumps required by State Electricity Commission of Queensland—three driven by electric motor and three by combined electric motor and steam turbine drive. Motor should be of squirrel cage screen protected type, suitable for 50 c/s 3-phase, a.c., 415 V. Secretary of Commission, Scottish Union House, Eagle St., Brisbane.

Jan. 20, 1953.—Uruguay. Administracion Nacional de Combustibles, Alcohol y Portland requires a 700 kW diesel-electric generating set, 3-phase, a.c. 6,300 V, 50 c/s. B.o.T. (Ref. CRE 36279/52)*.

Jan. 21, 1953.—Australia. Supply of tubular aluminium busbar and accessories for State Electricity Commission of Queensland, Scottish Union House, Eagle St., Brisbane. B.o.T. (Ref.: CRE 36266/52)*.

CONTRACTS PLACED

B.E.A. 30 MVA 66/11 kV transformers and auxiliary transformers at St. Marylebone, Hackbridge and Hewittic Electric Co., Ltd.; 3,300 V and 415 V auxiliary switchgear at Portishead, near Bristol, English Electric Co., Ltd.; coal handling plant at Tilbury, Mitchell Engineering, Ltd.; three 830,000 lb/hr boilers and ash and dust handling plant at Castle Donington, Babcock and Wilcox, Ltd.; 11 kV and lower voltages cables and connections at Meaford B, W. T. Henley's Telegraph Works Co., Ltd.; two 30,000 kW turbo-generators with feed water and condensing plants and auxiliary apparatus at Ocker Hill, Richardson, Westgarth and Co., Ltd., also modifications to existing 33 kV switchgear installation and control room equipment, British Thomson Houston Co., Ltd., and two 36 MVA generator transformers, both at Ocker Hill, Ferranti, Ltd.; Uprating of 1,500 MVA 132 kV switchgear and provision of busbar protection at Wolverhampton, General Electric Co., Ltd.; 3,300 V and 415 V auxiliary switchgear at Bold station, English Electric Co., Ltd.; one 85,00 lb/hr oil-fired boiler at Wallasey, Yarrow and Co., Ltd.; One cooling tower, Film Cooling Tower (1925), Ltd. and extension of cooling water culverts at Skelton Grange, Marples Ridgway and Partners, Ltd.; 132 kV transformers at Stella North, C. A.

Your Queries — Answered

"Mixmaster" mixers, agents for? T.E.—S. Guiterman and Co., Ltd., 120 Jamaica Rd., London S.E.1. (24329)

"Regal" dry shavers, address of? B.E. — Pontings, Kensington High St., London W.8. (24304)

"Rockman" soldering guns, address for spare elements? D.P.—Electromico Manufacturing Co., Ltd., 18a Boxmoor St., London W.1. (24311)

"R.E.S." irons, suppliers of? L.A.—Telefrige Service, 193 Mare St., Hackney E.8. (24316)

"Poliflor" floor polishers, suppliers of? E.B.—C.C.A. (Vacuum Cleaners) Ltd., 109 South St., Ponders End, Enfield, Middx. (24322)

Carlisle Electrical Manufacturing Co., Ltd., address of? D.N.—Bent St., off Derby St., Cheetham, Manchester 8. (24291)

"Luxolite" lighting fittings, makers of? D.E.—Franco-British Electrical Co., Ltd., 15-17 King St., London S.W.1. (24336)

The above are selected from questions we have answered this week. If you have a query send it to us.

Parsons & Co., Ltd.; 11,800 V and lower voltages, cables and accessories at Roosecote, Drake and Gorham, Ltd.; one generator transformer at Portobello, Bruce Peebles and Co., Ltd.; two 30,000 kW turbo-generators and auxiliary apparatus at Clyde's Mill, English Electric Co., Ltd.; 275 kV 7,500 MVA switchgear at Staythorpe substation, Metropolitan-Vickers Electrical Co., Ltd.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Wednesday morning)

	£ s. d.	New York price
COPPER, electrolytic	285 0 0	—
LEAD, good soft pig (foreign)	91 15 0	112 0 0
,, ,, "English" quality ...	93 5 0	
Tin (99·99·76%) ... .. (Cash)	958-959	—
,, (3 months)	939-940	—
ALUMINIUM, commercial purity (del.)	166 0 0	—
ZINC	110 0 0	100 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	53 0 0	—
Mild Steel Tape (0·04 in.)	39 15 0	—

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Acarat and Co., Ltd., 49 Church St., Eccles, Manchester. Mchts., mnfrs., repairers, processors and fitters of elec. appliances, etc. Cap.: £100. Dirs.: A. Hulme and K. Buckley.

Achievement Scintillating Signs, 235 Manningham Lane, Bradford. Electrical sign makers, sign writers, etc. Cap.: £100. Dirs.: D. A. Dalgleish and Mrs. S. Dalgleish.

Britton and Murray, Ltd., The Garage, Greenfield Ave., and Cardiff Rd., Dinas Powis, Glam. Garage proprs., automobile, mechanical and electrical engrs., etc. Cap.: £2,000. Dirs.: R. C. Britton and E. T. Murray.

Cannon Electric Distributors, Ltd. Cap.: £1,000. Dirs.: Gwyneth M. Forrester and Wendy J. Forrester. Subs.: K. A. Wyndham-Kaye and M. A. Bryceson, Essex House, Essex St., W.C.2.

Colosseum General Electrical (Holloway) Ltd. Cap.: £100. Dirs.: to be appointed by subs. Subs.: W. Corob, 25 Spirehall Close, N.W.4 and Betty Springer 7 Surrey Court, Finchley, N.3.

Electrical Export Co. Ltd., 13 Dunster Drive, Kingsbury, N.W.9. Cap.: £1,000. Dirs.: L. Payne and A. J. Douglas.

Fraikad, Ltd., 59 Brompton Rd., S.W.3. Elec. and mech. engrs. and contractors, etc. Cap.: £500. Dirs.: E. Frais, P. Kader and G. Feld.

Gerrard Electronics Ltd., Charter House, 52 Gloucester Place, W.1. Cap.: £100. Manufacturers of and dealers in gramophones, wireless transmission and receiving apparatus, television, etc. Dirs.: not named. Subs.: R. R. Jones and R. Feldman.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Charles Amplifiers (Sales) Ltd. Meeting of members and creditors will take place at 11-12 Finsbury Sq., London E.C.2, on Dec. 4, at 3 p.m. to receive liquidators' report.

Coldstream Automatic Refrigeration Ltd. At meeting on Oct. 24 resolution passed for winding-up and W. Le'Resche Hand, Inc. Acc., Fletcher's Chambers, Fore St., Birmingham, was appointed liquidator.

Crescent Engineering Works (Tonbridge) Ltd. Resolutions passed at meeting on Oct. 18 for amalgamation and transference to Crescent Cold Storage Ltd., and voluntary winding-up. Mr. Alan C. Durrant, C.A., 130 High St., Tonbridge, was appointed liquidator, and creditors are asked to send particulars to him by Nov. 30.

Ezee Appliances (Kingsbury) Ltd. Resolution for voluntary winding up passed at meeting on Oct. 15, when S. Poynter, 1 Broadway House, Broadway, Mill Hill, N.W.7, was appointed liquidator.

T. A. Knight Ltd. Resolution for voluntary winding-up passed at meeting on Oct. 21, when W. P. Barnfield, The Bridge, Walsall, and R. F. Bendall, 126 Colmore Ave., Birmingham, were appointed joint liquidators.

Petronic Ltd. At meeting on Oct. 29 resolution passed for voluntary winding-up and G. F. Webb, 7 Gt. Winchester St, E.C.2, was appointed liquidator.

Taylor's of Carshalton Ltd. Resolution for winding-up passed at meeting on Oct. 13, when A. W. Hunter, of Walter House, 418-422 Strand, W.C.2, was appointed liquidator.

BANKRUPTCY ACTS

Application for Discharge

Ipswich. Jack Cooper, mechanical and electrical engineer, trading at Market Place, Orford. Hearing fixed for 10.30 a.m. on Dec. 10 at Shire Hall, St. Helens St., Ipswich.

Intended Dividends

Barnsley. Sydney E. Jones and George W. A. E. Short, dry battery manufacturers, trading as S. E. Jones and Co., at Elsecar. Last day for receiving proofs, Nov. 12. Trustee is John B. G. Moore, Official Receiver, 55 Queen St., Sheffield.

Great Yarmouth. Albert J. Martin, electrical engineer, trading at High St., Stalham. Last day for receiving proofs, Nov. 12. Trustee is F. R. D. Walter, Official Receiver, Castle Chambers, Opie St., Norwich.

First Meeting

Brentford. Lionel J. Quick, electrical distributor trading at 2 The Mall, Ealing. First meeting at 3 Central Buildings, Matthew Parker St., Westminster, tomorrow (Fri.) at 11 a.m., and public examination at The Court House, Half Acre, Brentford, on Jan. 9, at 11 a.m.

Release of Trustee

London. Hannah Rose Aarons, trading as Radio Co. (wholesalers), Leyton, at 764 Lea Bridge Rd., and 35 Tallack Rd., E.17. Trustee was B. Phillips, Inc. Acc.; 76 New Cavendish St., W.1.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Merthene. 710,251. Class 9. Electric cables. Mersey Cable Works Ltd., Linacre Lane, Bootle, Liverpool.

Natalex. 708,679. Class 17. Electrical insulating materials. Nathan and Allen Ltd., 131 Victoria St., S.W.1.

BUSINESS PROSPECTS

HOME

Abergavenny (Mon.) T.C. Approval given to erection of 66 houses on Llwynn site.

Barnsley. Scheme approved for first instalment of Mining and Technical College in Church Street. This part is expected to cost £122,000.

Bath. It is proposed to build an eleven-storey block of 44 flats at Snow Hill.

Bedfordshire. Plans approved for erection of secondary modern school at Sandy. Estimated cost £61,000.

Cornwall. Erection of junior school at Penzance has been approved.

Crawley. Lloyds Register Printing House are to have new printing works and office on industrial site. Quantity Surveyors are Gardiner and Theobold, 24 Bedford Sq., W.C.1.

Darlington. Erection of junior school in Hulton Ave. Borough Architect, Central Buildings.

Dublin. Plans approved for new cigarette factory in Cashel Rd. for Tobacco Importers Ltd.

Felling U.D.C. Tenders out for site preparations for 76 houses at Pelaw. Plans are by Chief Housing Officer, R. Morton.

Finchley. Secondary school is to be built in Summers Lane.

Golborne U.D.C. Scheme submitted to Ministry for erection of 68 houses on Derby Rd. estate.

Hastings. Plans being prepared for erection of shops on Hollington estate.

Hayes (Middx.). Scheme approved for erection of R.C. secondary school in Springfield Road.

Keighley. Revised plans have been approved for extension to Technical College in Lord Street.

Leeds. Erection of 318 dwellings on Swarcliffe estate, Seacroft. City Architect, Priestley House, Quarry Hill.

Londonderry T.C. Construction of 106 houses on Creggan estate. Housing Architect, 5 Guildhall Street.

Louth T.C. Erection of 66 dwellings on Eastfield Rd. estate. John T. Chenery, Town Clerk, Town Hall.

Luton. It is proposed to build the Luton and S. Bedfordshire College of Further Education; estimated cost is £253,500. Also Eagle Aviation Ltd. propose to erect workshops, hangar, stores, etc., at Luton Airport, costing about £38,400.

Nantwich (Ches.) U.D.C. Next year's programme includes erection of 253 houses. Largest groups are 50 at Wistaston and 29 at Newhall.

Newbury T.C. It is recommended that tenders be invited for the installation of electricity in 308 houses on various sites at present lit by gas.

Newcastle-on-Tyne. Plans in hand for new housing estate at West Denton comprising 354 dwellings and estimated to cost £473,522. City Architect is George Kenyon, 18 Cloth Market.

Norwich. Erection of 43 dwellings on South Park Ave. estate. City Architect, City Hall.

Offaly. Fire Station is to be built adjacent to present Civic Guard Station at Kilcormac.

Peterlee (Dur.). Norden Colliery Social Club is planning erection of new premises to cost about £50,000. Work expected to extend over ten years.

Southend T.C. Complete layout has been approved for 528 dwellings on Somerset Gardens site.

Stockport. Nurses' block costing £50,000, outpatients and physiotherapy depts. under consideration for Stepping Hill hospital.

Thornaby-on-Tees T.C. It is proposed to supply electricity to about 250 houses in Northumberland Rd. area. Estimated cost £10,000.

Uxbridge. Construction of R.C. secondary school at Ickenham has been approved. Layout plans approved for 126 houses on Maygoods Farm estate.

Wakefield. Erection of 100 houses on Kettlethorpe estate. W. S. des Forges, Town Clerk, Town Hall.

Wigan T.C. Application to be made for sanction to borrow £97,212 for 18 police houses, and 48 houses on Carr House estate.

Worsley (Lancs.) U.D.C. Construction of about 95 dwellings in neighbourhood unit 3, Little Hulton. H. Lomax, Clerk, Town Hall, Walkden, Manchester.

TRADE NOTES

Acquisition. Bowthorpe Holdings, Ltd. have purchased the entire shareholdings of Cheltenham Plastics Ltd., and are now able to offer, in addition to the injection mouldings and tubings made by its subsidiary, Hellerman Ltd., a wide range of P.V.C. extrusions, including tubing.

Change of title. The name of the V.G. Manufacturing Co., Ltd., has been changed to the V.G. Porcelain Co., Ltd.

Agents. Unity Heating Ltd., have appointed Electrical and Allied Distributors (N.I) Ltd., 94 Gt. Victoria Street, Belfast, as their agents for Unity domestic, industrial and temperature control and heating equipment for Northern Ireland.

Chilton Electric Products Ltd. have appointed Andrew Sloss Ltd., 15 Wellington St., Glasgow, C.2, to handle their miniature circuit-breakers in Scotland, and Baker, Duthie and Co., Ltd., 131 West Regent St., Glasgow, C.2 to handle their electric dry shavers in Scotland.

New Branch. Simplex Electric Co., Ltd. have closed their Newcastle-on-Tyne branch at Carliol Square and have opened a branch at Kent House, Church St., Gateshead-on-Tyne. There, a showroom will be opened shortly.

Organisation. Enthoven Solders Ltd., the newly formed concern, has been organised into two divisions. One of these divisions is under the direction of Mr. W. J. Myers, who will handle all solid solder. The other will be controlled by Mr. F. C. Thompson, who will deal with cored solder and solder specialities.

Mexico Duties. Increased duties on a number of items under the import tariff of Mexico are set out in decrees just published on washing machines. On most items the *ad valorem* duty is the same, but the entry duty of one or so pesos has been increased.

Tungsten Ore. As from October 31 the selling price of the Ministry of Materials for tungsten ores of standard 65% grade and ordinary grade is: Wolframite 432s. 6d., Scheelite 422s. 6d. per long ton, delivered.

MEETINGS TO NOTE

THURSDAY, NOV. 6

A.S.E.E. (S. London Branch).—"Radar Aids to Navigation." Gp. Capt. E. Fenessey. Cafe Royal, Croydon, 8 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish Section).—"Development of Radio and Electronics Industry in India." G. D. Clifford. Engrng. Centre, Sauchiehall St., Glasgow, 7 p.m.

I.E.S. (Birmingham Centre).—Ladies' Night.

I.E.S. (Nottingham Centre).—"Effect of Light in Growth and Development of Plants." Miss D. Vince. Elect. Board Offices, Smithy Row, 6 p.m.

I.E.S. (Bradford Group).—"Glass and its Manufacture." F. Mathers. Y.E.B. Offices, 45/53 Sunbridge Rd., 7.30 p.m.

I.E.S. (Exeter Group).—Brains Trust with E.A.W. Providence Hall, Northernhay St., 7 p.m.

I.E.E. (London).—"Telemetering for System Operation." R. H. Dunn and C. H. Chambers. Savoy Place, W.C.2, 5.30 p.m.

FRIDAY, NOV. 7

INSTN. OF MECHANICAL ENGRS.—"Water Turbine Governors." N. G. Dennis. Storey's Gate, S.W.1, 5.30 p.m.

ASSOC. OF ELECTRICAL MACHINERY TRADES.—Annual Ball at Savoy Hotel (Lancaster suite), London, 6.45 p.m.

I.E.S. (Bath and Bristol Centre).—Brains Trust with E.A.W. Elect. Board Offices, Colston Ave., Bristol, 5.30 p.m.

I.E.S. (Huddersfield Group).—"Modern Aerodrome Lighting." J. W. Morse. Elect. Showroom, Market St., 7.15 p.m.

I.E.E. (N.W. Utilisation Group).—Dinner and dance at Apollo Cinema Restaurant, Ardwick Green, Manchester, 6.30 p.m.

I.E.E. (S. Midland Centre).—"Teaching of TV Servicing." R. G. Moseley. College of Technology. Birmingham, 7 p.m.

MONDAY, NOV. 10

LEICESTER ELECTRICAL SOC. —"Instruments: their Construction and Characteristics." J. Collins. Elect. Offices, Charles St., 7 p.m.

INCORP. PLANT ENGRS. (Dundee Branch).—"Something for Nothing in Heating." H. W. L. Tuckey and H. F. Taylor. Mathers Hotel, 7.30 p.m.

I.E.S. (Sheffield Centre).—"Application of Modern Flash Discharge Tubes." C. R. Bicknell. University, Western Bank, 6.30 p.m.

I.E.E. (London Education Circle).—Discussion on "Teaching of Illumination Engineering." S. S. Beggs, Savoy Place, W.C.2, 6 p.m.

I.E.E. (Merseyside and N. Wales Centre).—Annual dinner at Exchange Hotel, Liverpool, 6.30 p.m.

I.E.E. (N.E. Centre).—"Voltage Transformers and Current Transformers associated with Switchgear." W. Gray and A. Wright. Neville Hall, Westgate Rd., Newcastle, 6.15 p.m.

I.E.E. (S. Midland Supply and Utilisation Group). — "Inhibited Transformer Oil." W. R. Stoker and C. N. Thompson; also "Stability of Oil in Transformers." P. W. L. Gossling and L. H. Welch. Imperial Hotel, Birmingham, 6 p.m.

A.S.E.E. (Central London Board).—"Recent Developments in Fluorescent Lighting." Dr. H. H. Ballin. St. Ermin's Hotel, S.W.1, 6.45 p.m.

TUESDAY, NOV. 11

NEWPORT ELECTRIC CLUB.—"Intelligent Use of Electricity for Space Heating." J. L. Ryecroft. Tredegar Arms Hotel, 7 p.m.

I.E.S. (London).—Three short papers on "Factory Lighting." 2 Savoy Hill, W.C.2, 6 p.m.

I.E.E. (London Measurements Section).—Dinner at Cafe Royal.

I.E.E. (Cambridge Radio Group).—Chairman of Radio section's address by E. C. S. Megaw. Cavendish Laboratory, 8.15 p.m.

I.E.E. (N. Midland Centre).—"Economics of L.V. Electricity Supplies to New Housing Estates." F. G. Copland. B.E.A. Offices, Whitehall Rd., Leeds, 6.30 p.m.

I.E.E. (N. Ireland Centre).—"Phototelegraphy and Facsimile Transmission." J. Bell, J. A. B. Davidson and E. T. A. Phillips. Presbyterian Hotel, Howard St., Belfast, 6.45 p.m.

I.E.E. (S.W. Scotland sub-centre).—"Economic Plant Sizes and Boiler-Set Groupings on British Grid." B. Donkin and P. H. Margen. 39 Elmbank Crescent, Glasgow, 7 p.m.

I.E.E. (N.W. Utilisation Group).—Discussion on "Protection of Industrial Installations—Case for Argument." Engineers' Club, Albert Sq., Manchester, 6.15 p.m.

A.S.E.E. (Bolton Branch).—"Organisation." D. V. Burling. Balmoral Hotel, Bradshawgate, Bolton, 7.30 p.m.

WEDNESDAY, NOV. 12

BRITISH INSTN. OF RADIO ENGRS. (N.E. Section).—"Radio Counter Measures." H. J. Barton-Chapple. Instn. of Mining and Mech. Engrs., Neville Hall, Westgate Rd., Newcastle, 6 p.m.

INCORP. PLANT ENGRS. (E. Midlands Branch).—"An Aspect of Fuel Economy." H. E. Partridge. Welbeck Hotel, Nottingham, 7 p.m.

I.E.E. (London Radio Section).—"Radio Telemetering." E. D. Whitehead and J. Walsh. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Lancs sub-centre).—"Logical Approach to Problems of Electric Space-Warming." D. H. Parry. N.W.E.B., Darwen St., Blackburn, 7 p.m.

I.E.E. (S.E. Scotland sub-centre).—"Design of High-Speed Salient Pole a.c. Generators for Water-Power Plants." E. M. Johnson and C. P. Holder. Heriot-Watt College, Edinburgh, 7 p.m.

I.E.E. (N. Scotland sub-centre).—"Technical Colleges and Education for Electrical Industry." H. L. Haslegrove. Caledonian Hotel, Aberdeen, 7.30 p.m.

I.E.E. (Southern Centre).—"Radio Controlled Models." P. A. Cummins. R.A.E. College, Farnborough, 7.30 p.m.

I.E.E. (Oxford).—"275 kV Developments on British Grid System." D. P. Sayers, J. S. Forrest and F. J. Lane. Southern Board, 37 George St., 7 p.m.

A.S.E.E. (Bradford Branch).—Lecture by E. Sheard at Midland Hotel, 7.30 p.m.

THURSDAY, NOV. 13

E.P.E.A. (Merseyside Tech. Group).—"Power Station Layout." S. D. Whetman. Elect. Showroom, Whitechapel, Liverpool, 7 p.m.

BRITISH INST. OF MANAGEMENT.—Annual conference opens at Harrogate and closes on Nov. 15.

INSTN. OF HEATING AND VENTILATING ENGRS. (Liverpool).—"Automatic Controls." F. M. H. Taylor, Radiant House, Bold St., 6.30 p.m.

INCORP. PLANT ENGRS. (Edinburgh Branch).—Annual dinner.

INCORP. PLANT ENGRS. (Newcastle-on-Tyne Branch).—"Gas and Oil Engines." A. C. Yeates. Roadway House, Oxford St., 7.30 p.m.

I.E.S. (Manchester Centre). — Annual luncheon and President's address.

I.E.E. (London).—"A 150 kV X-ray Equipment for Radiography of Circumferential Welds in Gas-Turbine Rotors." F. W. Waterton. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (E. Midland Centre).—"Electrical Engineering in Steel Tube Industry." H. E. Knight. George Hotel, Kettering, 7.30 p.m.

I.E.E. (N. Scotland sub-centre).—"Technical Colleges and Education for Electrical Industry." H. L. Haslegrove. Royal Hotel, Dundee, 7 p.m.

I.E.E. (Swansea sub-centre).—"Economics of L.V. Electricity Supplies to New Housing Estates." F. G. Copland. Central Public Library, 6 p.m.

FRIDAY, NOV. 14

INSTN OF MECHANICAL ENGRS.—Thomas Hawksley lecture on "Mechanism of Work-hardening in Metals." Prof. N. F. Mott. Storey's Gate, S.W.1, 5.30 p.m.

E.I.B.A. — Electrical Industries Ball at Grosvenor House, Park Lane, W.1.

MANCHESTER ASSOC. OF ENGRS.—"Instruments and Control Gear for Chemical Plant." A. Thompson and W. T. Thomas. Engrs'. Club, Albert Sq., 6.45 p.m.

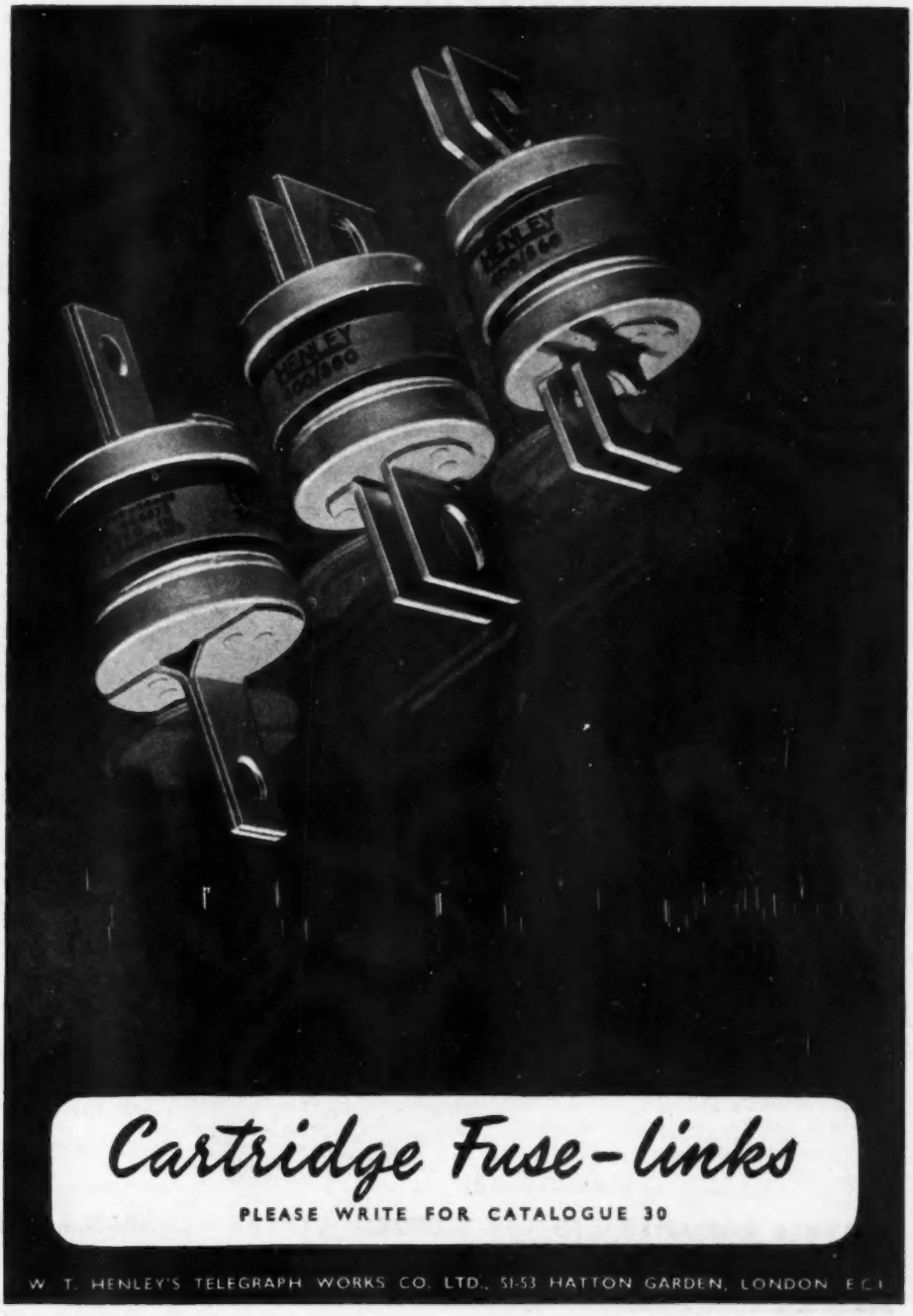
E.P.E.A. (S. Meter Engrs. Group).—"Polyphase Metering Equipment." D. Nuttall, Caxton Hall, S.W.1. 6.30 p.m.

EXHIBITION DIARY

Handicrafts and Hobbies Exbn. First national show under this title opened at Central Hall, Westminster, on **Oct. 30** and closes on **Nov. 12.**

Public Works Congress and Exbn. Opened at Olympia, London, on **Nov. 3**, continuing until **Nov. 8.**

Business Efficiency Exbn. will take place at Kelvin Hall, Glasgow, between **Nov. 4** and **14.**



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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

BOROUGH OF NUNEATON

STREET LIGHTING

TENDERS, to be delivered by November 24, are invited for the PROVISION AND INSTALLATION of sodium discharge street lighting over a continuous length of 1,530 yards to Group A standard.

Specification, etc., obtainable from the Borough Surveyor, Council House, Nuneaton, on the payment of a deposit of £2 2s. (B 502)

SOUTH WESTERN REGIONAL HOSPITAL BOARD

Mid-Wilts Hospital Management Committee

St. Andrew's Hospital, Chippenham

ELECTRICAL REWIRING

TENDERS are invited for the REWIRING for Power, Lighting, Patients' Call System and Radio System at St. Andrew's Hospital, Chippenham. Tender documents may be obtained from A. N. Irens, Esq., M.I.E.E., Consulting Engineer, Haycroft, Filton, Bristol, on deposit of £2 2s., returnable on receipt of bona fide tender and return of documents loaned for the purpose of tendering. Sealed tenders in plain envelopes endorsed "St. Andrew's Hospital—Rewiring" must reach the Consulting Engineer not later than noon on Monday, December 1, 1952. The Board does not bind itself to accept the lowest or any tender.

RUTH E. MADDOX,
Group Secretary.

c/o St. Andrew's Hospital,
Chippenham.
November 3, 1952. (B 510)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF
GENERAL ASSISTANT DISTRICT ENGINEER

Rochdale District

THE successful applicant will be required to assist the District Engineering Staff in the construction, operation and maintenance of an o/h and u/g distribution system, and will be required to undertake standby duties.

Graduate membership of the Institution of Electrical Engineers or exempting qualifications an advantage.

Salary scale: £528 to £545 p.a. Grade F.II. N.J.B. conditions.

Applications to Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Union Street, Oldham, by November 15, 1952. (B 491)

GOVERNMENT OF KUWAIT

QUALIFIED ELECTRICAL AND MECHANICAL ENGINEER required for service with the Government of Kuwait, Persian Gulf, to act as personal assistant to the Chief Electrical and Mechanical Engineer to the Government. The applicant should have good experience of electrical distribution and administration of an electrical department and be capable of making sound decisions on his own account for submission to the development department of the Government of Kuwait. The consolidated salary will be from £2,000 to £2,500 per annum, depending on qualifications and experience. Free furnished accommodation, when available, will be provided also medical attention and air passage out and home. —Applications, stating age and giving full particulars of technical qualifications, practical training and subsequent experience should be addressed in the first instance to the Secretary, Ewbank and Partners, Limited, 10-11 Grosvenor Place, London S.W.1. (B 460)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 79/52

APPLICATIONS are invited for the following superannuable appointments at the new Carmarthen Bay Power Station, Burry Port:—

1. MAINTENANCE ENGINEER (MECHANICAL). N.J.B. K.6 (£911 to £952 per annum).

2. STATION CHEMIST. N.J.B. K.7 (£844 to £881 per annum).

Applicants for (1) should have had wide experience in power station mechanical maintenance and should preferably be corporate members of the I. Mech. E.

For (2) should possess B.Sc. (Chem.) and/or A.R.I.C. and have had sound experience in water treatment, coal and oil testing and corrosion problems.

Application forms, obtainable from the Divisional Secretary, British Electricity Authority, Cardiff (Pengam Moors) Airport, Cardiff, should be returned by November 22, 1952.

October 31, 1952. (B 485)

LONDON COUNTY COUNCIL

LONDON COUNTY COUNCIL requires (a) TECHNICAL ASSISTANTS, and (b) JUNIOR TECHNICAL ASSISTANTS. Should have experience of (a) electric lift work, able to examine reports from outside staff and assess necessary work, make surveys and recommendations for improvements, or (b) in negotiating terms for supply and general consumers' liaison work. Applicants for (a) should have Higher Nat. Cert. (Elec.) or equivalent, for (b) Ord. Nat. Cert. (Elec.) or equivalent. Inclusive salaries up to (a) £675, (b) 200s.

Application forms from Chief Engineer, County Hall, Westminster Bridge, S.E.1 (quoting 52/43), returnable within next fourteen days. Enclose s.a.e. (1133). (B 466)

BRITISH ELECTRICITY AUTHORITY

South Western Division

BOILER HOUSE SHIFT CHARGE ENGINEER required at Portishead "A" Generating Station.

Superannuation scheme. Salary, N.J.B. Class "J," Grade 9, £699 to £728.

Applicants should preferably possess technical qualifications admitting to corporate membership of a recognised professional institution, have had sound mechanical training and experience in the design and operation of high pressure boiler plant.

Application forms, obtainable from the Divisional Secretary, 26 Oakfield Road, Bristol 8, to be returned not later than November 17, 1952.

November 3, 1952. (B 503)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London Allowance, and conditions of service in accordance with N.J.B. Agreement.

SECOND ASSISTANT ENGINEER
Group II H.Q.

Candidates must possess good technical qualifications and be familiar with the operational requirements of a large generating station. Knowledge of negotiating machinery for electricity industry an advantage. Successful applicant will be required to assist the Group Generation Engineer (Operation) in matters relating to control of large group of stations. Salary within Schedule C, Class "AX," Grade 2—£849 9s. to £992 5s. Ultimate maximum—£1,108 p.a.

THIRD ASSISTANT ENGINEER
Technical Department (Development Section)
Divisional H.Q.

Candidates should possess first-class technical qualifications and should have an aptitude for carrying out system development investigation on own initiative. A good working knowledge of symmetrical components and the methods of calculating load flows in complex a.c. networks is essential. Salary, Schedule C, Class "AX.", Grade 5—within range £660 9s. to £803 5s. Ultimate maximum £900 18s. p.a.

STATION CHEMIST
Barking "C" Generating Station.

Candidates should be professionally qualified by examination as well as having had some years industrial experience. The position will entail reponsibility for laboratory management and the analysis of fuels, oils, and waters, and matters connected with chemical aspects of power generation. Salary, Schedule A, Class "J," Grade 7—£831 12s. p.a.

Applications must be made on forms obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland Street, W.1, to be returned within 14 days of this advertisement. (B 488)

GOVERNMENT OF KUWAIT

QUALIFIED REFRIGERATION AND AIR-CONDITIONING ENGINEER required for the Government of Kuwait, Persian Gulf. Applicants to be men who have specialised in refrigeration and air-conditioning work, and have good knowledge of cold storage installations. They must also have had at least five years' experience in the design and operation of air-conditioning of large buildings and houses in countries where hot and dusty climatic conditions prevail. The engineer will be required to organise and operate a refrigeration and air-conditioning department, and will be responsible for design, installation, operation, maintenance of refrigeration and air-conditioning schemes including the servicing of existing room coolers, both British and American. The consolidated salary will be from £2,000 to £2,500 per annum, depending on qualifications and experience. Free furnished accommodation, when available, will be provided, also medical attention and air passage out and home.—Applications, stating age and giving full particulars of technical qualifications, practical training and subsequent experience should be addressed, in the first instance, to the Secretary, Ewbank and Partners Limited, 10-11, Grosvenor Place, London S.W.1. (B 461)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (GENERAL)

SOUTHAMPTON District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class "F," Grade 12, Column 1 (£487 per annum). N.J.B. Conditions of Service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, sub-station plant and distribution equipment. The appointment will involve stand-by duties.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Road, Bournemouth, and returned to him in envelopes suitably endorsed, not later than November 17, 1952.

F. W. KEMPTON,
Secretary.
(B 486)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY NO. 818—STATION SHIFT CONTROL ENGINEER, Westwood Generating Station, Wigan. Salary £588 to £610 (N.J.B. G.10).

Applications quoting Vacancy No. should be sent to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before November 15. (B 477)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Glasgow Sub-Area

APPOINTMENT OF
FIRST ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the position of First Assistant District Engineer in the Central District of the Sub-Area.

Applicants should have had a sound engineering training and subsequent experience with underground H.V. and L.V. distribution systems, including the maintenance and operation of H.V. and L.V. switch-gear, fault location on H.V. and L.V. cables and testing and protection gear. Corporate Membership of the Institution of Electrical Engineers or equivalent qualification would be an advantage.

The conditions of employment will be those of the Agreement of the National Joint Board and the salary will be in accordance with that agreement, viz. Class "F," Grade 5, £766 to £793 per annum.

The appointment will be superannuable under the British Electricity Authority and Area Boards' Superannuation Scheme.

The successful candidate will require to reside within a reasonable distance of district headquarters.

Applications should be made on forms to be obtained from the undersigned or the applicant's appropriate officer, and should be completed and returned to me not later than November 22, 1952.

J. CAIRNS,
Secretary.

75 Waterloo Street,
Glasgow, C.2.
November 1, 1952. (B 494)

HER MAJESTY'S COLONIAL SERVICE

APPLICATIONS are invited for the following posts:—

ENGINEERS
Posts and Telegraphs Department
(CSD 59/14/02) Nigeria

Vacancies exist for engineers in the Posts and Telegraphs Department, Nigeria. Appointment will either be on three years' probation for pensionable employment in the salary scale £830 to £1,560 or on contract at £895 to £1,719 the point of entry being determined by war service and approved experience. In the case of contract appointments a gratuity of £100 to £150 per annum is payable on satisfactory completion of contract. Free passages are granted for the officer and his wife, and assistance of up to £75 for a maximum of two children is granted in respect of their passages or maintenance in the United Kingdom. Furnished quarters, if available, are provided at low rents. Leave is granted at the rate of one week for each month of resident service in a tour of 18 to 24 months. Candidates, between the ages of 25 and 35, must be at least graduates of the Institution of Electrical Engineers or have a university degree in electrical engineering, preferably telecommunications, or be assistant engineers in the British Post Office. Candidates must have had experience of modern telecommunications practice, and preference will be given to those with experience on carrier and V.F. telegraph circuits, and V.H.F. multichannel equipment.

Intending candidates should apply in writing to the Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, S.W.1, giving brief details of their age, qualifications and experience. They should mention this paper and quote the reference number (CSD 59/14/02). (B 465)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SENIOR ASSISTANT (COSTS)

APPLICATIONS are invited for the appointment of SENIOR ASSISTANT (COSTS), to be directly responsible to the Cost Accountant in the No. 2 Sub-Area Accountant's Department, Eversley, Frodsham. Salary within range £580 to £640 p.a. (N.J.C. Grade 4).

Applicants should have a thorough knowledge of wages, costing and budgetary control of capital and revenue expenditure and the invoicing of contracting work. Possession of the Final certificates of the Institute of Cost and Works Accountants would be an advantage.

The appointment is superannuable and subject to medical examination.

Applications, stating age, experience and qualifications, should be addressed to the Manager, Ref. 81A, No. 2 Sub-Area, MANWEB, Electricity House, Sandiway, near Northwich, Cheshire. Closing date, November 24. (B 487)

BRITISH ELECTRICITY AUTHORITY

North Western Division

STATION SUPERINTENDENT required for Rawtenstall Generating Station, Lancs. (12.5 MW). Applicants should be qualified engineers. Experience in the management of a steam power station is desirable. Salary £917 to £926 to £936 (N.J.B. C.1).

Applications to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, quoting vacancy number 817, before November 14. (B 479)

BRITISH ELECTRICITY AUTHORITY

SCIENTIFIC STAFF

Research Laboratories, Leatherhead

CANDIDATES should have a First or Second-class Honours Degree in Electrical or Mechanical Engineering or in Physics and preferably some research experience. Duties include testing, development and research work in the laboratories and in the field in connection with the generation, transmission and distribution of electricity. Appointments, which are superannuable, will be made within the following N.J.B. grades according to qualifications and experience:—

SECOND ASSISTANT, Grade 3, £775–£1,134.
THIRD ASSISTANT, Grade 4, £697–£909.
GENERAL ASSISTANT, Grade 5, £511–£709.

Forms from D. Moffat, Director of Establishments, British Electricity House, Winsley Street, London W.1, to be returned by November 24, 1952. Quote reference AE/299. (B 459)

ENGINEERING AND TECHNICAL STAFF REQUIRED BY THE SOUTH AFRICAN RAILWAYS

APPLICATIONS are invited from suitably qualified candidates who are not over 45 years of age for employment by the South African Railways in the capacity of:

(1) DRAUGHTSMAN (Signals) and (Electrical) and,
(2) LABORATORY ASSISTANTS (Electrical).
(A recognised apprenticeship to a trade, as well as an appropriate technical qualification, is required).
(3) SIGNAL FITTERS, and
(4) ELECTRICIANS.
(A recognised apprenticeship to the trade concerned must have been served.)

Preference will be given to suitable candidates who are not over 35 years of age.

Fuller particulars may be obtained from any Employment Exchange where applications may be made.

Applications in writing, either for employment or for fuller particulars, may also be made to: The Advisory Engineer, South Africa House, Trafalgar Square, London W.C.2. (B 476)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

CROYDON "A" and "B" Power Stations—MAINTENANCE ENGINEER (MECH.). Applicants should have suitable technical training and qualifications and have had experience in the control of labour. Extensive experience in the maintenance of high pressure turbine and boiler plant and power station auxiliaries essential. N.J.B. conditions of service and salary, Class "K," Grade 6, £956 11s. per annum, including London Allowance.—Applications on forms obtainable from the Station Superintendent, Croydon "B" Power Station, Beddington Farm Lane, Purley Way, Croydon, Surrey, to be received by November 17, 1952. (B 489)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, JOINTER, preferably a Jointer (E.H.T.), at Haverfordwest in the Western Sub-Area of the Board.

Wages and conditions in accordance with the N.J.I.C. Agreement. Jointer (E.H.T.) 3s. 6½d. per hour—Jointer 3s. 4½d. per hour.

Applications giving details of present employment and previous experience should be addressed to the undersigned to arrive by November 17, 1952.

C. L. TOWNSEND,
Sub-Area Manager.

South Beach Pavilion,
Tenby. (B 490)

BRITISH ELECTRICITY AUTHORITY

North Western Division

GENERAL ASSISTANT ENGINEER required for Planning and Development Section of Technical Department at Divisional Headquarters. Candidates should preferably hold an engineering degree or have attained Higher National Certificate standard. Works experience in switchgear and protection would be an advantage. Salary, £481 to £674 per annum (N.J.B. Schedule C, Grade 9).—Apply to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before November 15. Quote Vacancy No. 815. (B 478)

ASSISTANT ELECTRICAL ENGINEER required by engineering firm. Duties will embrace all aspects of supply and installation of electrical equipment in steel works and glass works. Good theoretical knowledge of d.c. and a.c. motors and automatic control schemes desirable. Permanent progressive position for keen man. Pension scheme.—Apply, stating salary required and brief details of experience, to Stein and Atkinson, Ltd., 25 Wilton Road, Westminster, London S.W.1, endorsed "Electrical Engineer." (B 369)

CHIEF ENGINEER required by high tensile steel wire manufacturers in Yorkshire. Applicants must be over 30 years of age and possess a degree or equivalent in electrical engineering and must be competent in mechanical engineering and heat-treatment furnace construction. The post involves complete control and administration of plant maintenance and installation and the supervision of building operations. The successful applicant must show evidence of having successfully held a position of similar responsibility, although not necessarily in the wire industry and must, essentially, be ambitious. Commencing salary, £1000 per annum.—Applications to Box No. 2161, Electrical Times. (B 469)

DISTRIBUTION ENGINEER required for service in the British West Indies.

Applicants should not be less than 35 years of age should have had a public school education and must be corporate members of the Institution of Electrical Engineers.

Applicants must have at least ten years experience in overhead and underground distribution systems up to 11 kV, and must be capable of administering a supply system, including consumer agreements and tariff settlements.

The post will carry a salary (including bonus) of £1,500 per annum, and furnished quarters will be provided and the company will pay for air or sea passage for the selected candidate.

Three months leave, on full pay, together with passage to this country, will be granted on completion of each three years of service.

Applications, giving full particulars of education, training and experience to Box No. 2171, Electrical Times. (B 480)

ELECTRICAL CONTRACTORS operating in all areas of United Kingdom and carrying out all types of electrical installations, invite applications from ENGINEERS and LINESMEN experienced in overhead line survey, design and construction, large factory wiring; Air Ministry and Admiralty cable laying and jointing; refrigeration, radio and television, etc. Men of all grades required. Good prospects and superannuation.—Write, giving full details age and experience, and salary, required to Box No. 2157, Electrical Times. (B 455)

ELECTRICAL DRAUGHTSMAN required by KUWAIT OIL COMPANY for London Office. Must have served full electrical apprenticeship with reputable organisation preferably on high voltage switchgear. Possession of at least O.N.C. in electrical engineering essential and must have had 3 or more years D.O. experience on electrical work, including layout and function of H.T. switchgear in sub-stations and power stations. Age 22 to 30. Salary according to age and experience. Pension scheme. Lunch vouchers.—Write for application form giving personal details and quoting L.O.192 to Box Z/127 c/o 191, Gresham House, E.C.2. (B 481)

ELECTRICAL ENGINEER required to work under responsible engineer and take charge of, and be responsible for operation and maintenance of the electrical machines and equipment in a large pulp and paper mill. A period of training will be arranged before full responsibility is handed over. Experience of paper or pulp mill work an advantage but not essential. Qualifications must consist of the Higher National Certificate and membership of the Institution of Electrical Engineers.—Apply, in the first instance, to The Chief Engineer, The Bowater Paper Corporation Limited, Northfleet, Kent. (B 426)

ELECTRICAL FITTER for substation construction and maintenance work required in the Welwyn Garden City District of the Northmet Sub-Area, Eastern Electricity Board. Conditions of service and rates of pay will be in accordance with the N.J.I.C. Agreement.—Applications, stating age, experience and present appointment, should be forwarded within 14 days of the appearance of this advertisement to: The District Manager, Eastern Electricity Board, Northmet Sub-Area, Electricity Offices, Bridge Road East, Welwyn Garden City, Herts. (B 497)

HIGH FREQUENCY SENIOR ELECTRICAL ENGINEER required for maintenance and operation of large high frequency unit. Top position, high salary and opportunity for experienced go-ahead man.—Write full details in confidence to Director, Microcell Ltd., 56 Kingsway, London W.C.2. (B 493)

JUNIOR ENGINEER, ELECTRICAL, for London office installation and engineering contractors.—Box No. 2135, Electrical Times. (B 423)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59, unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

JOHN BRUCE AND PARTNERS, Engineering Consultants, invite applications from MECHANICAL and ELECTRICAL ENGINEERING ASSISTANTS. Applicants should have had experience in the design, layout and site supervision of erection of large high-pressure steam generating installations, large turbo-alternator installations and associated coal and ash handling plant, e.h.t., h.t. and l.t. switchgear and boiler and turbine auxiliary machinery, the design, layout and site supervision of erection of large pipework installations up to the highest pressure and temperature conditions in use today; the design, layout and site supervision of erection of large industrial steam generating and steam utilising installations, including electrical generation by back pressure or pass-out turbo-generators; the design, layout, and site supervision of erection of heating installations for industrial purposes by steam in conjunction with industrial process steam systems or back pressure or pass-out turbines. Applicants must have served a recognised apprenticeship, be prepared to work hard and prepared to work on a drawing board or put on a boiler suit as necessary. The firm does not operate a five-day week and applicants must be prepared to work or travel in the evenings, Saturday afternoon or Sunday if the urgency of work demands it. Location of work, in the first instance, is in London, either on office duties or on site of works, as required. Good salaries will be offered to applicants with the required qualifications. —Applications, in the first instance, should be addressed to Box No. 2141, Electrical Times. (B 437)

LARGE ELECTRICAL CONTRACTORS have a vacancy for an ELECTRICAL DESIGN ENGINEER experienced in all types of electric lighting and power installations. Excellent prospects for advancement. Salary up to £950 p.a. All applications treated in strict confidence.—Please write to Box No. G6456, Strand House, London W.C.2. (B 504)

LEADING MANUFACTURERS of Coronation Floodlights require REPRESENTATIVES in exclusive territories, to operate on commission basis. Support given with publicity and sales-aids, etc. Liberal terms to energetic salesmen.—Please send fullest details in strict confidence to Box 3605, Knight's, 105 Baker St., London W.1. (B 483)

LEADING OIL COMPANY have a vacancy for a qualified ELECTRICAL ENGINEER as sales representative. Applicants must have connections with electrical equipment manufacturers, B.E.A. boards and divisions, N.C.B. areas, etc.—Applications should include personal particulars, details of past experience, salary required, car, etc. Box No. 2173, Electrical Times. (B 482)

MAJOR OIL COMPANY require one ELECTRICAL ENGINEERING DRAUGHTSMAN for work in London with possible visits to refineries in U.K. or abroad. Age 25 to 30 years. Ordinary National Certificate essential and Higher National Certificate desirable. Practical experience to include five years apprenticeship followed by three to five years in the drawing office engaged on electrical layouts of power station plant, h.v. sub-stations and distribution networks.—Write, giving full details and quoting Dept. M.1871, to Box No. 6322, c/o 191 Gresham House, E.C.2. (B 505)

MANAGER for London Branch of National E.W.F. Wholesaler, with experience and drive to develop large turnover. Previous experience in a similar capacity essential. Salary, commission, expenses, pension. —Box No. 2143, Electrical Times. (B 438)

REPRESENTATIVE with previous sales experience with manufacturer required for the sale of cookers, street lighting equipment, appliances, and industrial fittings, in the Essex, Buckinghamshire, and North London area. Must reside in area and own car.—Box No. 2175, Electrical Times. (B 495)

REQUIRED for Ceylon an ELECTRICAL ENGINEER with experience of a.c. power installations and distribution. Experience in contracting work and general mechanical engineering an asset. Attractive terms for single man.—Write Box P.481, Willing's, 362 Gravs Inn Road, London W.C.1. (B 468)

STATION CLERK required for Clarence Dock Power Station, British Electricity Authority, Merseyside and North Wales Division. N.J.C. conditions. Salary £640 to £700. Superannuable. Power station experience, including fuel recording, stores systems, operation records and statistics, etc., is essential.—Applications to the Divisional Secretary, Beaconsfield Road, Woolton, Liverpool, not later than Monday, November 17, 1952. (B 492)

REPRESENTATIVE required by manufacturer for sale of lighting fittings, appliances, switch gear, etc., to wholesalers in the Greater London area. Previous experience of the wholesale trade essential.—Box No. 2177, Electrical Times. (B 496)

TECHNICAL ENGINEER required to assist in department dealing with the design and operation of power plant projects. Qualifications must include a British university degree in either mechanical engineering or in physics, and any two of the following:—

(a) Practical experience of the operation of large steam-raising and/or power generating plant.

(b) Experience of design of power and steam-raising plants in project stages.

(c) Experience in testing of boilers, turbines, cooling towers, dust extraction plant, etc.

(d) Experience in the project design of large instrument and automatic control systems for thermal power plant.

Applications, giving age and full details of experience and qualifications, should be addressed to the Secretary, Ewbank and Partners Ltd., Engineering Consultants, 10/11 Grosvenor Place, London S.W.1. (B 424)

TECHNICAL INSTRUCTOR to supervise and assist on-the-job training of electrical tradesmen and apprentices required for Middle East by large oil company. Applicants—apprentice-trained, H.N.C.—should have practical and instructional experience and aged under 35. Generous salary and paid home leave; pensionable post; no married accommodation for first tour.—Write quoting No. 272 to Box No. 6296 c/o Charles Barker and Sons Ltd., 31 Budge Row, London E.C.4. (B 471)

TRACTION SUPERINTENDENT required by Crompton Parkinson Limited, Chelmsford, to take charge of the production of railway, trolleybus and tramway motors, diesel electrical equipment, etc.—Applicants, who must have had extensive experience in this class of work, should write giving age, full details of training and experience to General Manager. (B 470)

APPOINTMENTS WANTED

ELECTRICAL ENGINEER (27), A.R.T.C.S., H.N.C., heavy and electronics, seeks technical representative. Experience contracting, maintenance and commercial.—Box No. 2129, Electrical Times. (B 392)

WORK WANTED

A.C. and d.c. MOTOR REWINDS and REPAIRS. Prompt service, fully guaranteed. Edgware 5566 (4 lines). —Service Electric Co., Ltd., Stanmore, Middx. (A 19)

BRASS LIGHTING FITTINGS cleaned and gilded. Crystal chandeliers repaired and cleaned. Outside lanterns gilded and waterproofed.—Arts and Antiques, 49 Berwick Street, London W.1. (B 393)

CASTINGS. Fisher Foundries Ltd., Greet, Birmingham, have capacity for brass, gunmetal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (A 647)

ELECTRIC motors, stators, etc., REPAIRED AND REWOUND. Vacuum cleaner and electric tools rewound. Seven-day service.—The Motor Winding Co., 18 Gipsy Hill, London S.E.19 (Gipsy Hill 0354). (B 321)

METALWORK. All types cabinets, chassis, racks, etc., to your own specifications.—Philpott's Metalworks, Ltd., Chapman Street, Loughborough. (A 352)

MOTOR GENERATOR SETS built to customers' requirements from new and/or modern reconditioned machines. Guaranteed for twelve months. Good deliveries, competitive prices.—Enquiries to Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (Ext. 347). (B 402)

PRESSINGS. Assemblies, wire work, spot and arc welding, capstan work. Quick service. Large quantities material available. Quotations by return. Specialists in sub-contract work.—Mountsorrel Pressings, 20 Loughborough Road, Mountsorrel. (B 273)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 11)

WANTED. D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (A 7)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (A 3)

WANTED O.I. CIRCUIT BREAKER, 400/3/50, from 250 amp to 1,000 amp and upwards. Ellison preferred.—Fyfe, Wilson and Co., Ltd., Engineers, Bishop's Stortford. (B 499)

WANTED, ROTARY CONVERTORS, any size. Universal, 221 City Road, London E.C.1. (A 9)

38 WIRE ARMOURING MACHINE, with compound pots, taping heads, etc. Input bobbins, 17 in. diameter. One 112 BOBBIN STRANDING MACHINE ("Hedgehog" type). Input Bobbins 6½ in. diameter. Two WIRE WINDING MACHINES (Hanson and Edwards type). Take-up drum 15 in. diameter. One 12 BOBBIN TUBULAR STRANDING MACHINE, 6½ in. diameter bobbins.—Reply to Box No. 2163, Electrical Times. (B 472)

AGENCIES

FLUORESCENT TUBE refilling specialists require AGENTS in all areas excepting London and Lancs. Must have facilities for the storing and distribution of tubes.—Qualpron (Elect), 43-45 Crawford Street, Glasgow W.1 (B 506)

FOR SALE

CABLES & WIRE

FOR SALE, two 520 yd drums 0·04 sq in. paper insulated lead covered D.W.S. 11 kV submarine CABLE as it lies at District Yard, Hawick Street, Yoker.—Apply to the South West Scotland Electricity Board, Clyde Sub-Area, 206 St. Vincent Street, Glasgow C.2. (B 511)

DOMESTIC APPLIANCES

GRUBB IMMERSION HEATERS. The new 7 kW model. No purchase tax. Provision for intermediate loadings as required. All lengths 16 in. to 30 in. Immediate delivery.—Write for particulars and terms to distributors, John Owner and Co. Ltd., Springfield Road, Birmingham 13. Tel.: Springfield 2939. (B 25)

ENGINEERING PLANT & MATERIALS

ALUMINIUM ALLOY. New flat sheets 6 ft by 3 ft, 24 gauge, 6 or more 22s. 6d., 1 ton, 2s. 9d. per lb. Carriage paid or delivered ex stock.—D. McMaster and Co. Ltd., Bures, Suffolk. Tel.: Bures 351/2. (B 484)

COLES THORNYCROFT CRANE, Mark VII. Series 7. Little used.—Box No. 2165, Electrical Times. (B 473)

FOR Sale: One 100 kVA pneumaitcally operated SPOT WELDING MACHINE, made by British Federal Welder and Machine Co. Ltd., suitable for 400 v, 50 cycles, single-phase, and fitted with ignitron contactor. Depth of throat 24 in. The machine has had very little use and may be seen in operation at Enfield, Middlesex. Price £600.—Apply to Haywards Ltd., Union Street, Borough, London S.E.1. Tel.: Waterloo 6035. (B 512)

PROJECTION WELDING MACHINE made by Sciaky, 100 kVA, 3-phase, 400 V, 50 cycle. Type P.M.1.P. This machine is new. Reason for selling, cancellation of contract.—F. C. Hewlett, W.S. Manufacturing Co. Ltd., 28 Sheepcote Street, Birmingham 15. (B 509)

750,000

NEW BALL RACES, ROLLER, THRUST AND TIMKEN RACES IN STOCK. STOCK LISTS AVAILABLE.

CLAUDE RYE BEARINGS

895-921 Fulham Road, London, S.W.6
RENown 6174 (20 lines). (B 274p)

GENERATING PLANT

DIESEL ALTERNATOR SETS in stock up to 500 kVA, 400/440 V, 3-phase, 50 c/s, 4-wire. Detailed stock list post free on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel.: 26311 (Ext. 347). (B 403)

DIESEL SETS by Lister—B.T.H., etc. 5 kVA to 37·5 kVA, all voltages, one and three phases, 50 and 60 cycles, new and unused engines. Guaranteed 12 months. Much below current prices. Over 100 sets available.—Fyfe, Wilson and Co. Ltd., Engineers, Bishop's Stortford. (B 500)

FOR SALE. GARDNER DIESEL, driving 18 kW G.E.C. motor, 110 V. Mounted on trailer with excellent rubber tyres. Immediate collection.—Box No. 2155, Electrical Times. (B 454)

FOR SALE. 360 b.h.p. 160 p.s.i. 375 r.p.m. double expansion Howden STEAM ENGINE No. 583, year 1917, direct coupled on a single bed plate to a 250 kW, 210 V Electric Construction Co. Ltd. compound wound d.c. GENERATOR with switchboard comprising circuit breaker, knife switches, kW/hr meter, voltmeter, reverse current relay. Shunt regulator. All in good condition. —Box No. 2179, Electrical Times. (B 507)

ONE English Electric ALTERNATOR, 10 kVA, 250 V, single-phase, 400 cycles. Fitted with automatic regulator. To be used for an alternator set, 1,500 r.p.m. continuous rating. Maker's serial No. 5P 1171-35.—Burroughs Adding Machine Ltd., Strathleven, Dumbarton. Tel.: Alexandria 555, Mr. MacFarlane. (B 513)

SALE, BATTERY CHARGER, motor-generator set, 6 and 12 V, complete with switchgear.—Can be inspected on application to Passenger Transport Dept., Halifax, to whom offers should be made. (B 501)

TURBO-ALTERNATOR SETS. 1,500 kW, 1,875 kVA, 3,300/3/50 pass-out geared Turbo Alternator Set by Metropolitan Vickers. New 1929. Self-contained type. 175/200 p.s.i., 600° F. to pass out up to 25,000 lb of steam per hr at 30 lb gauge, capable of full output without pass-out steam. Complete with in-built surface condenser, accessories and switchgear.

1,000 kW, 1,250 kVA, 3,300/3/50 pass-out geared Turbo Alternator Set by Metropolitan Vickers. New 1933. Self-contained type. 175/200 p.s.i., to pass out 15,000 lb of steam per hr at 30 lb gauge. It will also operate as a straight condensing set at slightly reduced output. Complete with in-built surface condenser, accessories and switchgear.

800 kW, 1,000 kVA geared Turbo Alternator Set by the E.E.C., operating at 6·6 or 3·3 kV, 3-phase, 50 cycles, designed for a steam pressure of 185 p.s.i., 650° F. Complete with surface condenser, accessories and switchgear.

200 kW, 250 kVA, 3,300/3/50 geared Turbo Alternator Set by Metropolitan Vickers. Self-contained type. 175 p.s.i., 600° F. Complete with in-built condenser, accessories and switchgear.

Also available, Boiler House Auxiliary Equipment, including:—

Weir De-aerator to deal with 60,000 lb of water per hr. Manufactured in 1935.

British Vacuum Soot Extraction Plant having main and secondary cyclones, 12-stage extractor, a.c. motor-driven.

Two Mather and Platt Turbo Boiler Feed Pumps, cap. 125 g.p.m., 535 ft head. Each driven by 36-h.p. 400/3/50 squirrel cage motor.

360-tube Greens Economiser, 220 p.s.i.

25 kW Belliss and Morcom steam-driven Alternator Set, 400/3/50, 180 p.s.i., exhausting to atmosphere.

George Cohen, Sons and Co., Ltd., Wood Lane, London W.12. Tel.: Shepherds Bush 2070 and Stanningley, nr. Leeds. Tel.: Pudsey 2241. (B 463)

Another new

HOUCHIN

DIESEL GENERATOR

HLD Alternator coupled to a Dorman 6 KA engine. This new diesel generator combines a Dorman 6 KA series engine with the Houchin HLD alternator and is available for early delivery. Output is 93 kW, 116 kVA at 1,500 r.p.m.

A booklet giving the complete specification is available and will be forwarded on request. Houchin Ltd., also manufacture a wide range of generating sets incorporating other well-known engines from 500 to 1,500 r.p.m., and HLD alternators from 50 kW to 1,000 kW.

HOUCHIN LTD.

GARFORD WORKS, GARFORD STREET, LONDON, E.14
Telephone: EAST 4123 (5 lines).
Grams.: Garfodia London.
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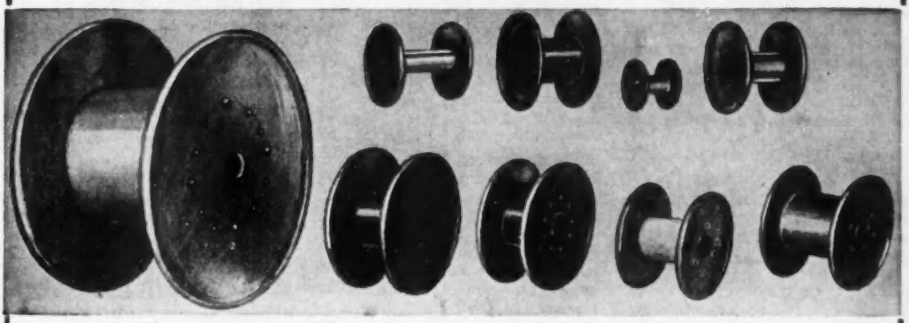

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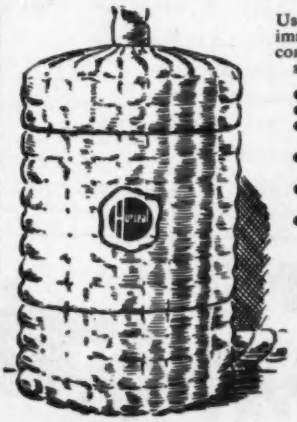

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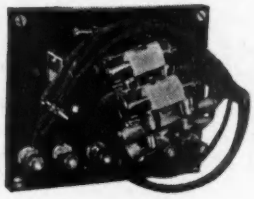

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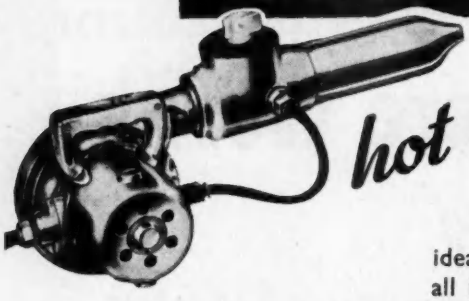

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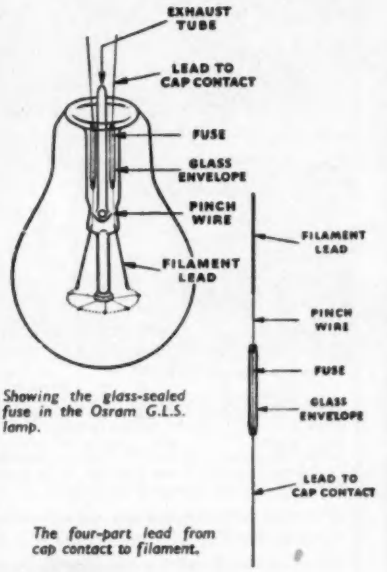

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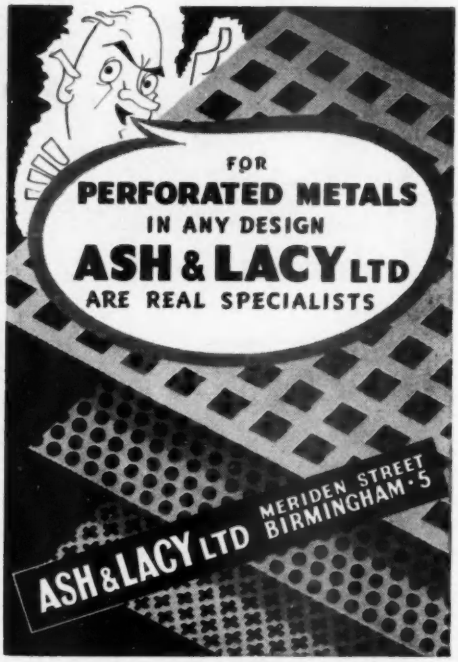

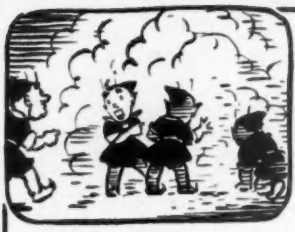

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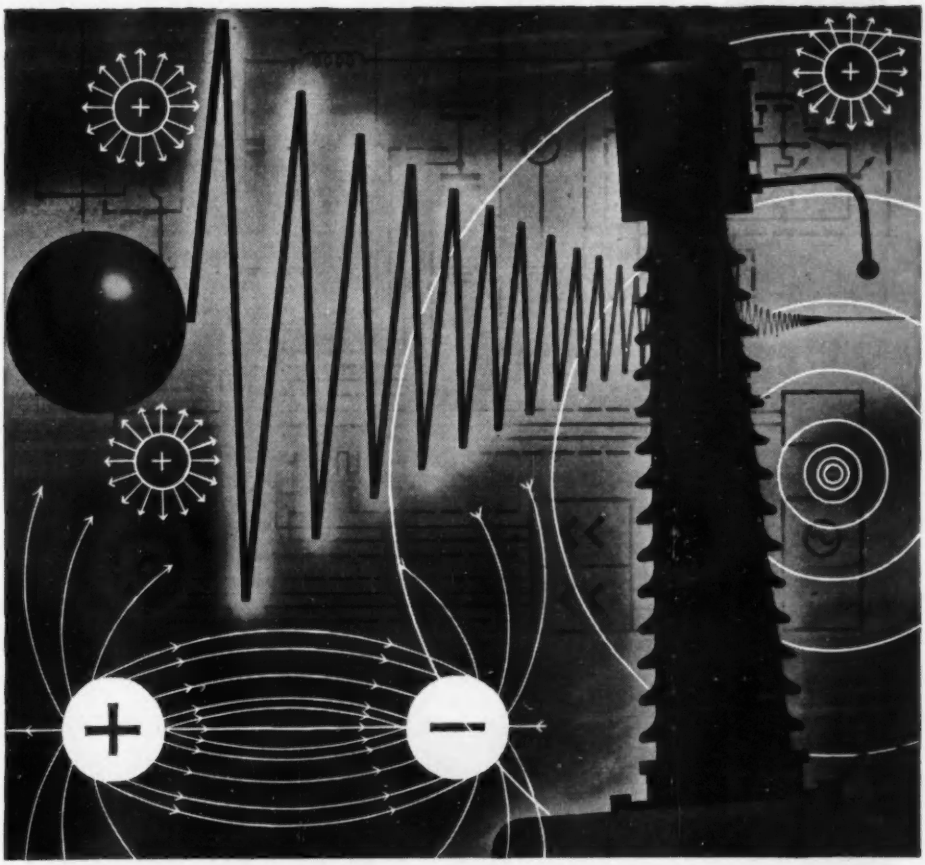

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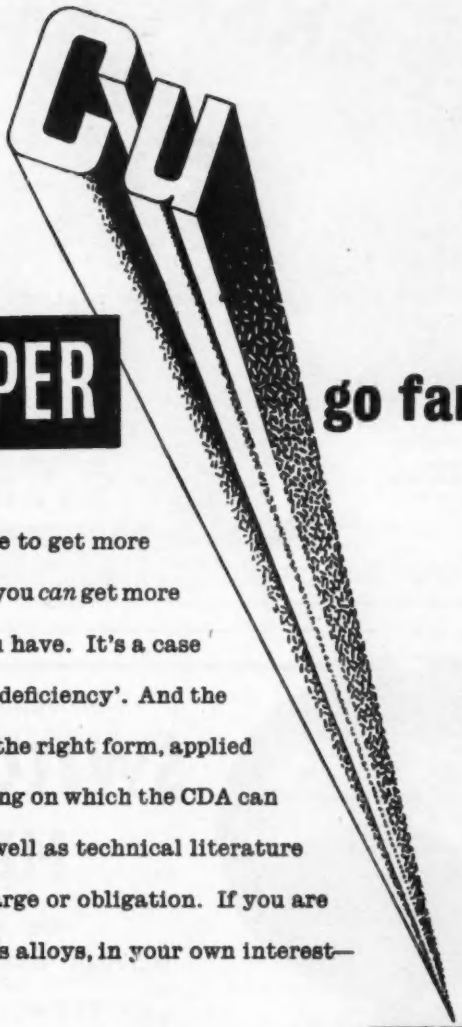

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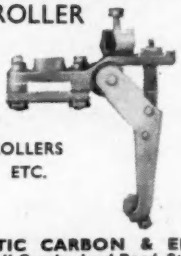

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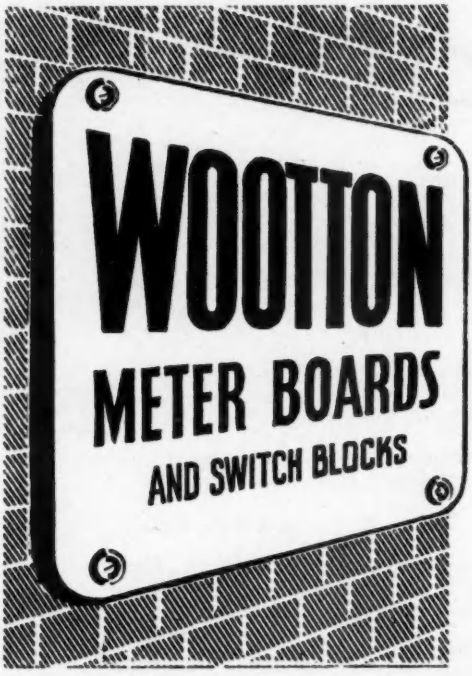

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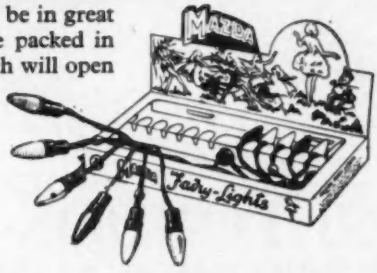

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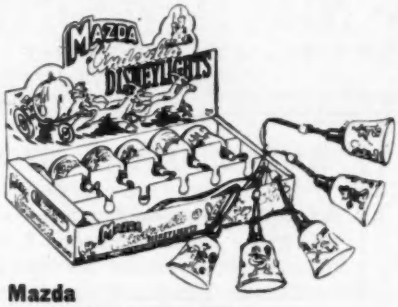

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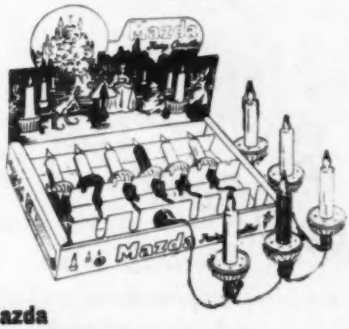

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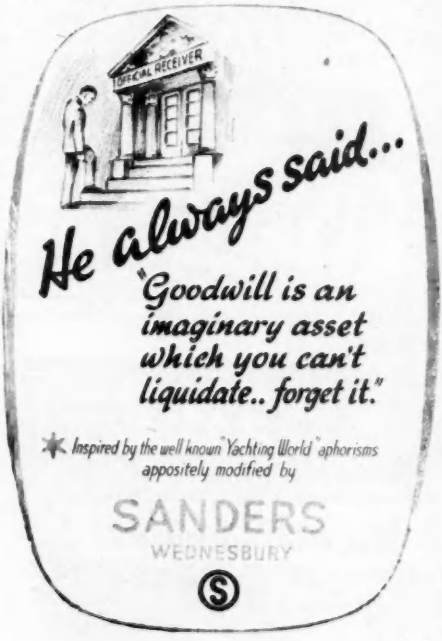

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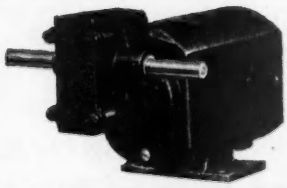

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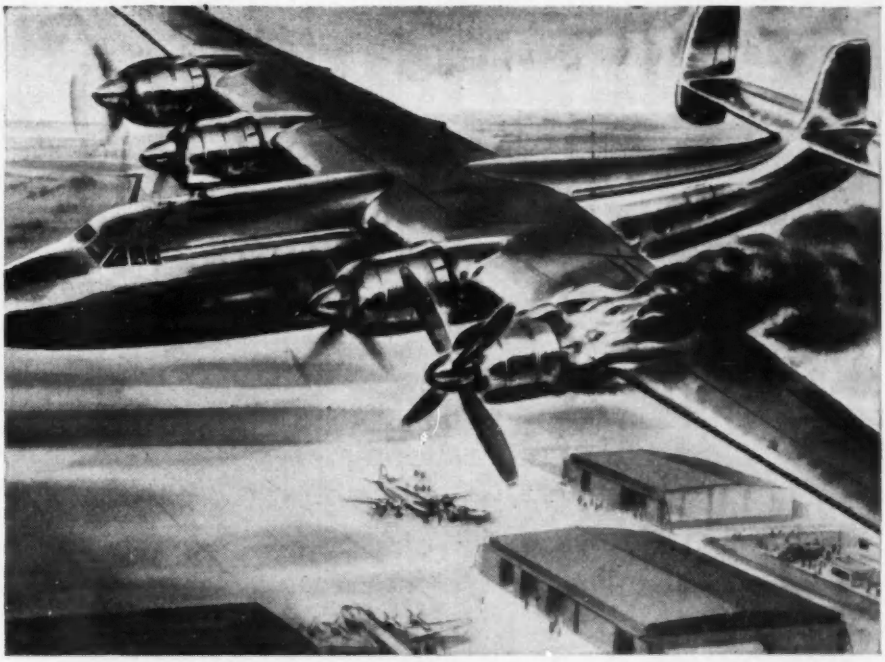

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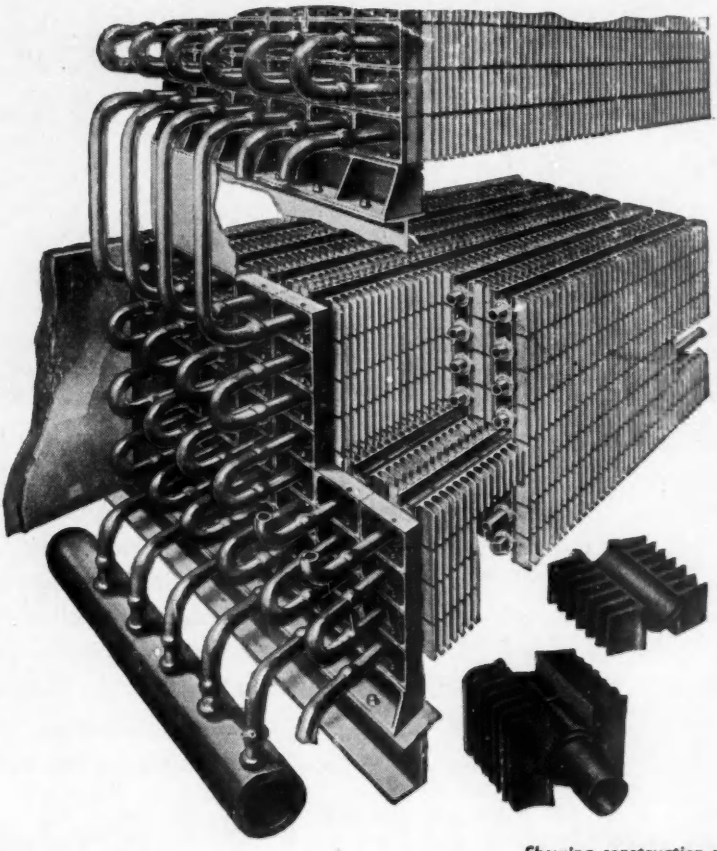

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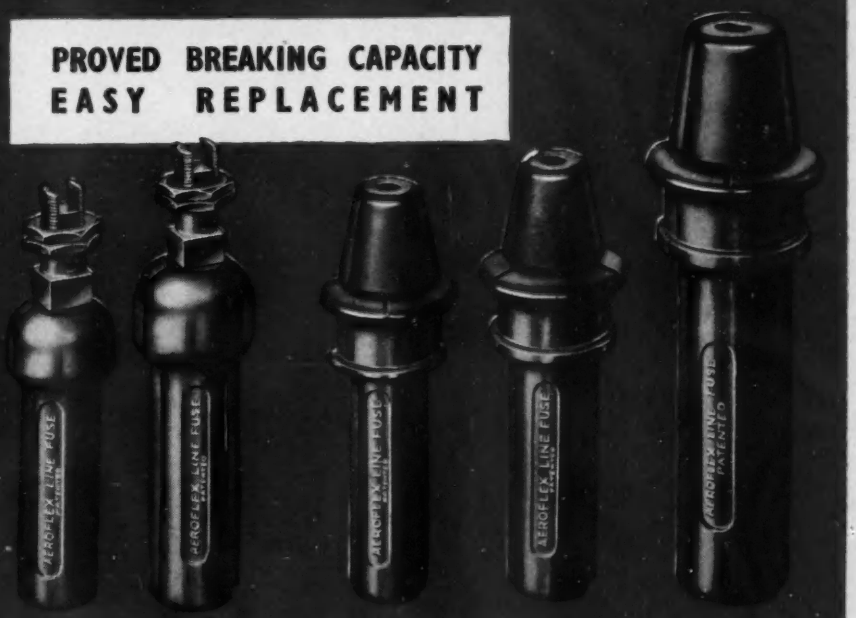

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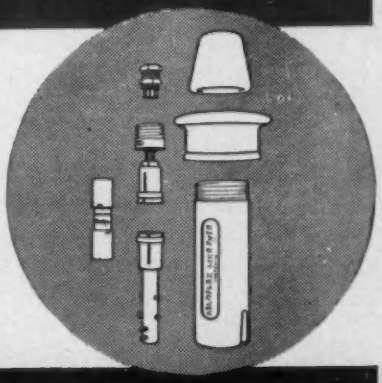

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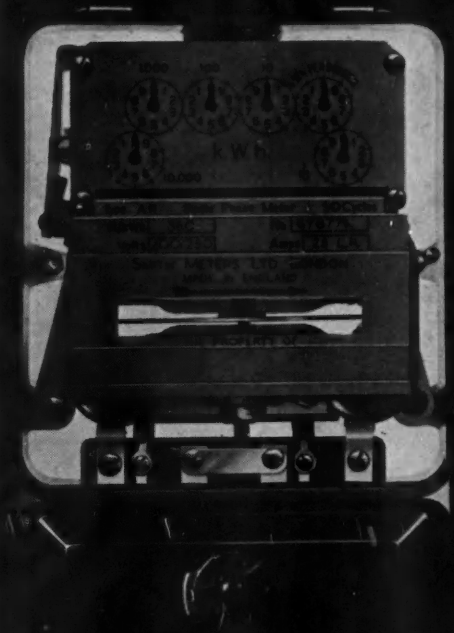

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